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The United States Navy

BY

REAR-ADMIRAL THOMAS P. MAGRUDER

U. S. N.

Illustrated with Official Photographs from the Navy Department

PHILADELPHIA

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to the memory of

CONGRESSMAN THOMAS S. BUTLER

1855-1928

for thirty-one years a member of the Committee on Naval Affairs of the House of Representatives, and for nine years chairman of that committee. A real friend of the United States Navy. A patriot!

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The
United States Navy

I

BATTLESHIPS AND BATTLE CRUISERS

ALL great naval battles of modern times have been decided by gunfire. Probably all major fleet engagements in the future similarly will be determined. The airplane, the submarine, the destroyer and the light cruiser have played and will play their important parts, yet they cannot of themselves win a decision. That is reserved for the big guns and for the vessels which carry them—the battleships and the battle cruisers.

Battleships may be defined as naval vessels of the largest tonnage, protected by the thickest armor and carrying the biggest guns. Battle cruisers are vessels as large as battleships, carrying guns of similar size, but less armor. Together the two types are known as capital ships. The big guns are their *raison d'être*. It is to carry and to serve the guns that these great vessels are built and manned. Largely because of the guns, the nation boasting a fleet with a superiority in capital ships—assuming equality in courage and tactical skill—will control the seas. Should a fleet weaker in battleships and battle cruisers essay an engagement, its defeat is probable. Should it avoid battle, the enemy fleet may take at will such a strategical position as to throttle commerce and, by resultant economic pressure, to win the war. The tremendous contribution to

victory made by the British Grand Fleet in 1914-18 is universally recognized.

It will be remembered that the Washington Conference treaties limited the capital ships of each nation represented to a given ratio. Between the three great naval powers—the United States, the British Empire and Japan—that ratio was fixed at 5-5-3. As a result the United States has today eighteen capital ships of 525,000 tons; the British Empire has twenty such ships of 559,000 tons; and Japan has ten of 301,000 tons. The treaty ratios, it will be observed, apply to tonnage and not to numbers.

To understand clearly the difference between a battleship and a battle cruiser, it is essential to comprehend the elements considered when a warship is designed. These elements are:

1. Displacement—that is, tonnage or size.
2. Armament—guns and torpedoes.
3. Protection—armor, armored decks and conning towers.
4. Speed—which is dependent on weight of machinery and fuel.

Now all four of these elements may be installed in a ship of any given displacement. Naturally the larger the ship the heavier may be the guns and the thicker the armor. Thus capital ships grew larger and larger until certain ones attained a tonnage of 40,000, a draft of 32 feet, a speed of 34 knots, and carried 16-inch guns and 14-inch armor.

The only actual limit to the size of capital ships is that fixed by practicability. The depth of channels leading to naval ports, the size of dry docks and—particularly where the United States is concerned—the width and depth of the locks on the Panama Canal must influence their dimensions. The last is important to our own Navy because it must consider the possibility of carrying on a campaign in either the Atlantic or Pacific Ocean. The Washington treaties, however, now limit the size of the capital ships to 35,000 tons.

Obviously any one ship cannot have a large number of heavy guns and, at the same time, the thickest armor and the greatest speed. Were this attempted the ship would sink. So there must be ever a compromise in the design of the capital ship.

Being given a displacement—let us say, for example, of 35,000 tons—the hull and bulkheads will represent a certain weight. If twelve 16-inch guns are installed in turrets and thick armor is provided, there will remain only a certain limited displacement available for machinery and fuel. Always, of course, there must be reserved a small percentage of the displacement to care for the weight of the necessary supplies, airplanes, catapults and personnel. If a ship is heavily armored a smaller percentage of the displacement can be assigned for machinery; whereupon it follows directly that the speed must be moderate or slow and the fuel supply limited. American designers have always insisted that American ships carry the heaviest practicable armament and thick armor. Their reasoning is

sound. As I have said, gunfire wins naval battles—gunfire combined with ability to withstand punishment.

The speed of ships in battle is, however, a valuable tactical factor. To assure this advantage some of the naval powers built enormous cruisers capable of making more than thirty knots. As this demanded that a very large part of the displacement be assigned to weight of machinery and fuel, it was essential to reduce the number of guns and to lighten the armor. The result was the battle cruiser—a fast battleship, but with fewer guns and less protection. The United States has no battle cruisers. The British and the Japanese each have four of such craft.

The present relative strength in capital ships of the three great naval powers follows:

Nation	Tonnage	No.	Battleships	Battle Cruisers
United States	525,850	18	18	0
British Empire ...	558,450	20	16	4
Japan	301,000	10	6	4

Gun power of the capital ships:

Caliber of Guns	United States	British Empire	Japan
16-inch	24	18	16
15-inch	..	100	..
14-inch	124	..	80
13.5-inch	..	48	..
12-inch	44	..	..
Total	192	166	96

BATTLESHIPS AT BATTLE PRACTICE

The table above is most illuminating. Since the range of a gun depends upon its caliber, the fleet having the largest number of the heaviest guns has a decided advantage in battle. This may be more clearly indicated by the following comparison of the number of British and American ships which can come into action at various ranges.

Range in Action	British Ships in Action	American Ships in Action
30,000 yards	3	5
24,000	13	10
23,000	20	13
22,000	20	15
21,000	20	18

Here it is seen that at ranges from 22,000 to 24,000 yards the number of British ships in action could outnumber the American ships by from 33 1/3 per cent to more than 50 per cent. In view of the superior speed of the British fleet over the American fleet, which is estimated to be at least two knots, the British fleet—if we may consider theoretically the unthinkable possibility of an encounter—could choose the most advantageous range. However, ships and guns alone do not win battles. In the last analysis always it is the personnel that is victorious. The gunnery of the American fleet is second to that of no other nation. A broad statement—and a true one.

The speed of the American battleships is about 21

knots. The speed of the Japanese battleships is around 23 knots, and Japanese battle cruisers can attain 27.5 knots. Of the British battleships, four have a speed of 21 knots, five of 23 knots, and seven of 25 knots. The speed of the four British battle cruisers is about 31 knots.

One of the newest and largest of all the battleships in the United States Navy is the *Colorado,* commissioned in 1923. Because of the Washington Limitation of Armaments Conference treaties, this is the last capital ship the nation will build for a number of years. A description of the vessel should give a clear and general idea of those marvels of marine engineering, the modern battleships.

The *Colorado* is 624 feet long on the main deck, has a beam on the water line of 97 feet and displaces 32,600 tons with normal load. Its speed is 21 knots. Exclusive of armor and armament, the vessel cost the Navy Department $27,000,000. Built primarily to fight in a great sea battle it may never fire a shot and yet give a return to the country for the great expenditure it represents. The ship is a vast experimental laboratory of marine engineering. Introduction of electricity not only for propulsion but for all power on shipboard has made such experimentation highly necessary. Commercial shipping interests cannot afford to try new ideas on a large scale; but they can benefit by the work of the Navy in that direction. The *Colorado,* as the latest type of naval vessel using electric propulsion and operation, provides invaluable data

on the subject, which are freely given to our shipbuilders.

The main battery of the warship consists of eight 16-inch, forty-five caliber guns, mounted in four turrets, two forward and two aft. The guns are the largest permissible under the treaty of Washington. In range and striking power they are unsurpassed. They can drop eight tons of steel and high explosive on the deck of an enemy twenty miles away—a blow that will disable any ship afloat. Such blows may be struck with amazing rapidity and accuracy. Three salvos can be fired in one minute. The accuracy of the fire is insured by efficient aiming of the fire control on the foremast, 140 feet above the water line. There are duplicate stations in other and better protected parts of the ship, to be utilized if the foremast is shot away. In addition to its heaviest armament, the *Colorado* carries twelve 5-inch guns and four 3-inch anti-aircraft guns. Two submerged torpedo tubes add to effectiveness in battle. Scouting planes are carried to provide the distant vision required in long-range action.

Almost as important as striking power is the ability to resist punishment. All the lessons taught by the great naval Battle of Jutland have been learned by our naval architects, who used this knowledge in designing the *Colorado*. An 18-inch armor belt gives side protection. The turrets, ammunition tubes and fighting stations are heavily covered. Several protected decks give added security. There is protection from

plunging as well as direct fire; from submarine torpedoes as well as from aerial bombs. Because of the great number of its water-tight compartments, it is doubtful whether the ship could be sunk even if struck by three or four torpedoes.

The United States Navy is unique in having for the propulsive force of its latest battleship the electric drive. The four propellers of the *Colorado* are electrically driven by direct-connected, two-speed induction motors, each of 8,000-horse power, supplied with current by two sets of turbogenerators. Each propelling motor can deliver a maximum of 8,375 horse power, having about 185 turns a minute. Steam is supplied to the turbines at 265 pounds pressure by a battery of eight oil-burning water-tube boilers. All auxiliary machinery, as, for example, pumps and blowers, is driven by direct-current motors. To furnish this current the vessel is equipped with three 300-kilowatt geared turbine sets.

The electric drive has many advantages. It assures greater efficiency and reliability than any other system of propulsion. Propeller shafts and steam pipes are shorter than in the less modern systems, as the motors can be placed near the propellers and the generators close to the boilers. Neither reversing turbines nor mechanical gears are required. The system also gives flexibility and, above all, the great tactical advantage of enabling the ship to reverse propellers at full power. In action this means greater maneuver-

BATTLESHIPS AND DESTROYERS LEAVING PORT

TORPEDO JUST MISSING A BATTLESHIP

ability and increased ability to dodge torpedoes threatening the ship.

A complement of 65 officers and 1,350 men is required to operate the *Colorado*. The payroll amounts to approximately $110,000 a month. The government ration provides daily more than three tons of nourishing, well-cooked food. Storerooms and refrigeration permit a three months' supply of provisions to be carried.

Living places for the personnel are spacious, light and comfortable. For additional comfort and sanitation the ship includes a hospital, with operating room; a dentist, with fully equipped office; a post office, with a mail clerk in charge; and a laundry which fixes no limit on the number of pieces.

Then there are in addition a library, a barber shop, tailor shop and cobbler shop, a ship's store and a telephone exchange. Attached to the galleys, or kitchens, are a butcher shop and a bakery.

There are also industrial shops, including the carpenter shop, paint room, machine shop, foundry and smithy in this community afloat. The *Colorado* resembles, in fact, a small, complete city with every facility and every convenience—even to a movie theater.

It may be of interest here to compare the latest type of British and Japanese battleships with the Colorado. The Japanese vessel *Mutsu,* completed in 1921, has the same main battery as the *Colorado,* is 1,000 tons larger, and has a speed two knots greater. It carries

a secondary battery of twenty 5.5-inch guns to the *Colorado's* twelve 5-inch pieces. The British battleships, *Nelson* and *Rodney,* completed in 1927, are the most powerful capital ships afloat. Naturally they must remain so for three years to come. Today they represent the last word in battleship design. Following are some of the features of these super-dreadnaughts:

Length .....660 feet	Mean draft ..... 30 feet
Beam .....106 feet	Displacement ..35,000 tons
Horse power, full speed 45,000	Speed .....23 knots
	Fuel oil .....4,000 tons

The main armament of each vessel consists of nine 16-inch guns in triple turrets, two forward and one aft. The secondary battery has twelve 6-inch guns in twin mounts, six 4.7-inch anti-aircraft guns, four 3-pounder guns and eight 2-pounder machine guns. The ships are armed with torpedo tubes also.

The machinery of the *Nelson*—and the *Rodney*—is of the reduction-turbine type, driving two propellers. Each vessel has eight boilers of the three-drum small-tube type.

Oil fuel only is burned under the closed-fireroom system of forced draft. Superheaters are fitted to each boiler. There is one large funnel.

From the progress made in the design of the *Nelson* class, I anticipate that the naval architects of the treaty-power navies will strive, when replacements are permitted in 1931, to design a battleship carrying twelve

16-inch guns with a speed of 21-23 knots on a displacement of 35,000 tons. Such a ship, in this country, would cost about $40,000,000.

The ancestor of the modern capital ship was Ericsson's little *Monitor*. A legacy of the battle between the *Monitor* and the *Merrimac* was the system of mounting guns in revolving turrets. Today there are ships with four three-14-inch-gun turrets. Tomorrow there may be ships with four turrets each having three 16-inch guns, all mounted on the center line and capable of being trained on either side of the ship. With so great a concentration of gunfire, it will be possible to fire a salvo of shell weighing eleven and one-half tons and projected at a speed of nearly 2000 miles an hour, and to fire a salvo every thirty seconds. These shell can hit a target seventeen miles away. At this distance the target is below the sea horizon and invisible to the gunners. The men point the guns in accordance with directions received from observers in airplanes. The observers spot the fall of the salvos and give directions by radio for changing the range and deflection, so that the officer controlling the gunfire may know how to straddle the target. This is known as the director system. One officer in a little compartment, high up on a mast, manipulates a director fitted with two telescopes—one for horizon train, or azimuth, and the other for elevation, or range—and a master firing key by which all turret guns are fired simultaneously. The two telescopes are mounted on turntables connected electrically to pointers at the gun, which follow

those of the elevated telescopes. The "man behind the gun" never sees his target. He simply makes his weapon follow the pointer.

This system may be used on battle cruisers as well as on battleships. As I have observed before, the battle cruiser is in reality a very fast battleship whose speed is possible because of fewer guns and less armor protection. The increase in speed makes the ship expensive to build and to operate.

The British have the latest designed battle cruiser, the *Hood,* as well as the 1927 battleships, the *Nelson* and the *Rodney.* The *Hood* is the largest warship afloat, and cost about $30,000,000. The *Nelson* and the *Rodney* each cost about $35,000,000. Differences between the *Hood,* a battle cruiser, and the *Nelson,* a battleship, are shown in the following comparison:

	Nelson	Hood
Displacement (tons)	35,000	41,200
Length (feet)	660	860
Beam (feet)	106	104
Draft (feet)	32	31½
Horse power	45,000	144,000
Speed (knots)	23	31
Fuel oil (tons)	4,000	4,000
Armament—16-inch guns	9	.....
Armament—15-inch guns	.....	8
Armament— 6-inch guns	12	.....
Armament— 5.5-inch guns	.....	12
Armor (inches)	14	12
Torpedo tubes	2	6

Battle cruisers were originated by the British, who built many of them before the Battle of Jutland in 1916. Originally the type was designed: (1) to drive enemy cruisers from the seas, (2) to destroy enemy commerce, (3) to protect sea routes, and (4) to scout for and report information of the enemy's main fleet. The ships were planned for speed and gun power, so they could pierce screens of cruisers or destroyers. In a fleet action the battle cruisers were envisaged as acting as a fast wing, able, by virtue of speed, to concentrate on the enemy van or rear, or to give needed re-enforcement to any part of the battle line. Later the Germans followed the initiative of the British and also built such warships.

Battle cruisers were used in the World War in the type of operation for which they were designed. A German squadron under Admiral von Spee created havoc with British shipping in the Pacific and South Atlantic. A British squadron including battle cruisers, commanded by Vice Admiral Sturdee, destroyed the German squadron off the Falkland Islands. In the early years of the war German squadrons attacked the seacoast towns of England. These raids were stopped by British battle cruisers, which, in the action of Dogger Bank, sank the old German cruiser *Blücher* and severely damaged the battle cruiser *Seydlitz*.

It may be recalled that on May 31, 1916, the British Grand Fleet and the German High Seas Fleet were in the North Sea. Each fleet had its scouting forces—battle cruisers, light cruisers and destroyers—well

ahead of the main body. The forces met in the afternoon and the five German battle cruisers engaged six British battle cruisers in a running fight leading toward the German fleet. In sixteen minutes the British battle cruiser *Indefatigable* was blown up and in thirty-eight minutes the battle cruiser *Queen Mary* suffered a similar fate. Their magazines exploded from the effect of gunfire. Soon after this the battle cruisers sighted the German High Seas Fleet ahead and were forced to turn about. They were followed by the German cruisers. The two fleets engaged in an indecisive battle, although the weaker German fleet inflicted greater damage upon the stronger British fleet.

At a critical moment in the battle, when the German battleships were outnumbered and in a poor tactical position, the German commander-in-chief ordered the battle cruisers and destroyers to charge the enemy. This they did. The British ships turned away to avoid the menace of torpedoes and the German fleet maneuvered clear of a crucial situation. Owing to poor visibility a British squadron of old cruisers butted into the German fleet and in a few minutes three out of four were sunk or put out of action. The third British battle-cruiser squadron also rushed into range of the German ships and in twelve minutes the battle cruiser *Invincible* was blown up by enemy gunfire. Truly, "What's in a name?" Rear Admiral Hood and 1,025 officers and men went down in the *Invincible*. Only six members of the crew were saved. Incidentally the German battle cruisers had more and

better armor protection than had the British. Yet to attain this they sacrificed speed and were forced also to carry lighter guns.

Ten minutes after the action started, the *Lion,* flagship of Vice Admiral Beatty, had the narrowest of escapes from destruction. A German shell penetrated the roof of one of the midship turrets. This caused the powder in the turret and tube from the handling room, which opened into the shell and powder magazines, to ignite. Immediately most of the turret and handling room crews were killed. The commander of the turret fell when both legs were shattered by the German shell. He managed to drag himself to the voice tube and to order the magazine doors closed before he died. This saved the ship. In the foretop with the gunnery officer, a young midshipman, perhaps sixteen years of age, was recording the incidents of the battle. When the turret was struck, flames from the burning powder within leaped high in the air and above the tops. "Look out for a bally big bump!" cried the midshipman to the gunnery officer. The bump never came. I have often wondered what were the feelings of this lad when he found himself still safe and sound.

A similar casualty happened in the after turret of the German cruiser *Derfflinger.* As in the *Lion,* the magazine doors were closed and the ship was saved from destruction. But in a second the lives of ninety officers and men were snuffed out by the fire from burning powder.

Just how important armor can be to a capital ship may be surmised from the fate of the vessels under heavy fire during the Battle of Jutland. The British battle cruisers had comparatively little protection; therefore they were faster than the German battle cruisers and carried heavier guns. In consequence, the *Indefatigable, Queen Mary* and *Invincible* were sunk soon after coming in range of the German battleships and battle cruisers.

During the battle the German battle cruisers suffered heavy damage. That they were not destroyed was due to better armor protection and good subdivision. Thus, the *Lützow* was struck by twenty-four heavy projectiles and yet remained afloat many hours, until the ship was finally sunk by the Germans to avoid any possibility of its falling into the hands of the enemy. The *Derfflinger* had twenty-three hits from heavy shells and limped into port drawing forty feet of water.

It was, however, the German battle cruiser *Seydlitz* that lived to tell the most exciting tale. This ship was struck by a torpedo. Fortunately the torpedo exploded forward and the bulkhead held, and, except for the disadvantage caused by a light list, the fighting power was not affected. Altogether the *Seydlitz* was struck by twenty-one heavy shells, and lost 153 killed and wounded. So seriously was the *Seydlitz* damaged eventually that the forecastle became awash and on entering port the draft was forty-two feet.

Since no nation may lay down a capital ship until 1931, naval architects have three years in which to

THE U.S.S. CALIFORNIA AND DESTROYERS PASSING IN REVIEW

THE U.S.S. COLORADO

design replacement vessels. Their work is made simpler by the fact that they are restricted to a displacement of 35,000 tons. The length and beam of the ships will depend upon the speed selected, as will also the armament and armor. Strategists and tacticians of the various nations will determine whether replacement ships shall be battleships or battle cruisers, and architects will design accordingly.

The speed of a fleet of capital ships is that of its slowest unit. That is a naval axiom. The United States battle fleet has a uniform speed of twenty-one knots and contains no battle cruisers. It is probable, therefore, that the next battleship for the United States Navy will have a speed of twenty-one to twenty-two knots; twelve 16-inch guns and very thick armor. It is probable also that this large number of the heaviest guns will be made possible by progress in engineering design and materials, permitting a reduction in the weight assigned for machinery and fuel. The naval architect also must provide plans to permit the vessel to carry airplanes, torpedo tubes and a large anti-aircraft battery, and to protect its vitals from damage by torpedoes and aerial bombs.

Such a monster of power will cost almost $50,000,000. Surely that will raise a protest from the passionate pacifist. Even the jingo and the choleric chauvinist may pause in their demands for replacements and augmented armaments. Undoubtedly it was the part of wisdom and good judgment to limit the capital-ship tonnage of the naval powers to the 5-5-3 ratio. The

same wisdom and judgment should dictate a further reduction in capital-ship tonnage to about 350,000 for Great Britain and the United States and to 210,000 for Japan. This is one of the things that should be done but that may be left undone.

Not infrequently it is stated by self-styled strategists that airplanes have sounded the knell of battleships. Even navy and army officers—those who presumably know the history of warfare and, at least, of elementary strategy and tactics—have stated publicly that the day of the battleship is over; that one airplane costing a few thousand dollars can with one bomb destroy a great battleship costing $40,000,000 or more. Claims of similar nature were made for the automobile torpedo when it was perfected forty years ago; and these did not materialize, either when the torpedo was placed aboard a small fast boat—the torpedo boat—or when it was installed in a submarine vessel.

The gun, torpedo and bomb all have the three essential elements of a weapon of destruction—that is, range, accuracy and destructive power. Now it may be conceded that the gun has greater range and accuracy than the torpedo. A 16-inch shell loaded with a high explosive has tremendous power for destruction, yet the explosive charge of a torpedo or a bomb is greater than that of any shell. The range of a torpedo is only about 12,000 yards. The range of the aircraft bomb may be hundreds of miles, but it has not the accuracy of the gun. The gun leads in accuracy,

the aircraft bomb in range and the torpedo in destructive power.

In choosing a weapon, however, the vulnerability of the carrier necessarily must be considered. It is obvious that the battleship is very much less vulnerable than is either the submarine or airplane. And the submarine is less vulnerable than the airplane. For protection the battleship relies upon armor, its own gunfire and maneuverability. The submarine protects itself by submergence. The bombing airplane has no protection except great speed, which makes it a difficult target for batteries.

Against the threat of every newly invented weapon, however, always there has been developed a method or system of parrying that weapon. The gun is the only weapon that must be conquered by its like. The threat of the torpedo boat was met by giving the battleships a large number of medium-caliber guns—the so-called secondary battery—and building larger torpedo boats for their protection. For protection against automobile torpedoes after they are launched from a torpedo boat or submarine, capital ships are provided with blisters, or an outer skin. This skin explodes the torpedo without serious damage to the ship. Further, a battleship is so divided into small compartments that even five or six torpedoes exploding alongside may not sink it, the only effect being to increase greatly the draft and to reduce to some extent the speed.

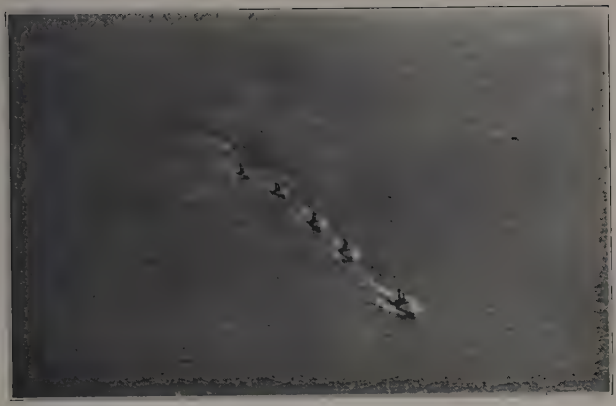
The submarine menace is met by the gun, by destroy-

ers, by the depth charge and by sound devices. To combat the bombing plane, there will be aircraft squadrons of fighting planes. These are small, very fast aircraft to which the larger and slower bombing plane must inevitably fall an easy victim.

Additional protection against planes is given by the installation of anti-aircraft batteries of machine guns so mounted that they may fire at any angle from the horizon to the zenith. Armored decks are also fitted, in the latest designed capital ships, to keep the bomb from damaging the machinery, magazines and other important parts. As weapons of offense at sea, airplanes have inherent limitations. The weather is one of prime importance. Their radius of action is limited to a few hundred miles. They cannot control the sea nor hold conquered territory.

In a recent statement discussing the battleship as an element of national defense, a distinguished officer and perhaps the United States Navy's leading strategist had this to say as to why a navy must have battleships:

"Trade on the sea or trade from overseas has always been borne in ships on the surface of the sea, so that the protection afforded has necessarily been by fighting ships. The efficacy of the protection has depended always and still depends upon the relative strengths of the fighting ships. This fundamental requirement of superiority in fighting strength at the point where enemy ships come in contact with each other has resulted in the development of what today



BATTLESHIPS STEAMING FULL SPEED IN COLUMN

BATTLESHIPS STEAMING FULL SPEED ON LINE OF BEARING

is known as the battleship—the ultimate development in a single unit of the maximum possible defensive and offensive power and mobility. Trade—ships carrying cargoes—must depend for their protection upon the superior fighting ability of the fighting ships that guard them.

"It goes without saying that notwithstanding the necessity for battleships, there is a corresponding necessity for the maximum possible development of those elements of warfare that contribute to the success of battleships. Life is always a growth and progress. One element of the progress of the day, so far as navies are concerned, is warfare in the air. Nations building battleships have to take this element into grave consideration and to meet in every possible way the defensive and offensive requirements which air development entails.

"It might be contended that vessels carrying aircraft alone could be used profitably unsupported by ships that place their primary dependence in war on a gun battery. Naval experience to date does not justify such a contention. Aircraft-carrying ships when unsupported fall an easy prey to vessels having long-range guns and special protection against the bombs which aircraft carry. One has only to consider the comparative helplessness of an aircraft carrier at night, or in bad weather, or in fog, to understand the tremendous difficulty under which such a vessel would operate if unsupported. It is, of course, possible to imagine ideal conditions under which the aircraft carrier

might have an advantage against the battleship, but war cannot be planned for on the basis of ideal conditions; average conditions are the only safe criterion.

"In overseas expeditions where large numbers of troops may have to be transported, it is essential that the forces escorting these troops be at all times—twenty-four hours of each day—superior to any forces that may be brought against them. Such superiority may be had only through the agency of ships capable of offensive and defensive action every hour of the twenty-four. Ships that place their primary dependence upon guns are the only ones so far developed that can be depended upon for this service."

Since the War of 1812, when American frigates with their heavier guns consistently defeated British frigates, it has been the policy of the United States Navy to arm its ships with the heaviest possible batteries. Let that policy continue and America will have peace and, with a broad human sympathy, be in a position to engender a spirit of good will throughout the world.

II

LIGHT CRUISERS

I AM distressed," once cried Lord Nelson to the Admiralty, "for frigates. They are the eyes of the fleet." Substitute the name "light cruiser" for "frigate" and one has the cry of great naval powers today. It would be an appropriate comparison, too, for the small swift-sailing frigates of Nelson's time aided and supplemented the two and three deck line-of-battle ships and convoyed the laden merchantmen exactly as the fast unarmored light cruisers supplement the dreadnaught and guard the transport of the modern era.

It is largely because of the light cruiser that naval and diplomatic representatives of the United States, the British Empire and Japan met in a tripartite Limitation of Armaments Conference at Geneva; that certain members of the Naval Affairs Committee of the House of Representatives charged other nations with violating the spirit of the Washington treaties; that Congress in 1927 provided money for a naval building program over the objection of President Coolidge.

Why, I am often asked, have the light cruisers, which are small modern warships, thus assumed so important a place in the eyes of the world? Why should their presence or absence distress great nations

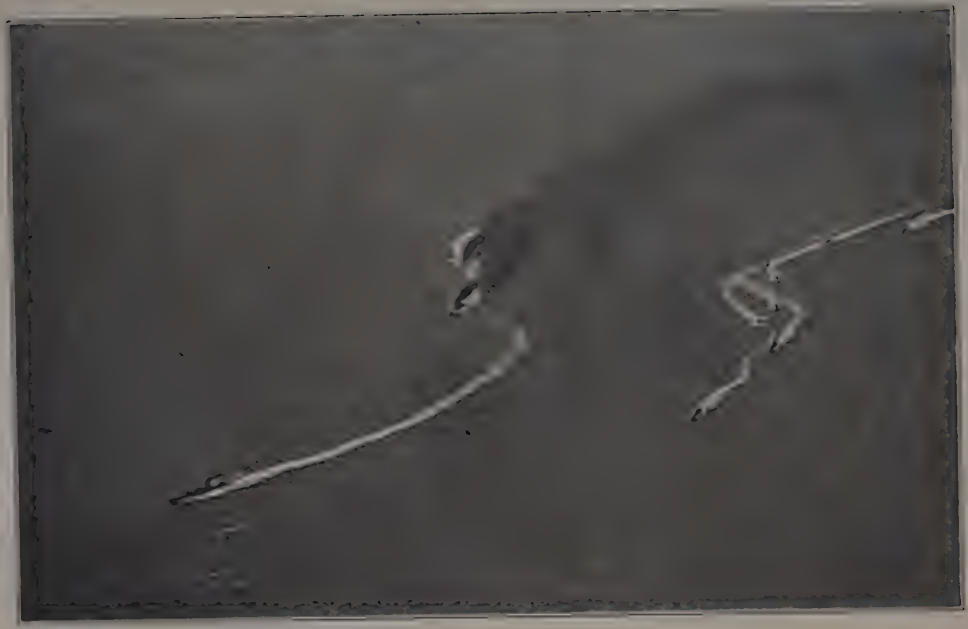
that can place their trust in 32,000-ton armor-clad battleships, carrying batteries of sixteen-inch guns designed to sink an enemy fifteen miles away?

To answer these questions two things must be clearly understood: first, what light cruisers are and what part they play in warfare; and second, just what provision was made concerning them and certain other ships in the now famous Limitation of Armaments Conference held in Washington in 1921, which the recent tripartite conference was presumed to supplement.

The modern light cruiser is a compromise. In this it is not unique. Virtually all fighting craft in the Navy are compromises. The battleship is the largest and most powerful of such vessels. The others are, in a sense, simply smaller battleships. Let us define them:

Battleships, to begin, are naval vessels of the largest tonnage, carrying guns of the heaviest caliber, protected by the thickest armor, and, *a priori,* are held by these to a moderate speed—about twenty-four knots. In a fleet—which is a sea army—the battleships correspond to the infantry of a land army. Operating in a predetermined area, they deliver the crushing blows which spell victory.

Battle cruisers are fast battleships. They gain speed by sacrificing some of their guns and armor. Their speed may be about thirty knots. They correspond in the sea army to field artillery in the land army. There are, of course, other uses in which they may be employed prior to the "great day"—that is, fleet action



LIGHT CRUISERS LEADING DESTROYERS TO AN ATTACK

to determine the mastery of the sea. This class appears to be now merging into the battleship type.

Light cruisers are warships still faster than the battle cruisers. They attain their speed of approximately thirty-three knots by sacrificing gun power and all armor. Their offensive power is augmented by torpedoes and mines, and recently by airplanes launched by catapults. In the sea army they correspond to raiding or scouting units of cavalry on land.

Destroyers are simply smaller light cruisers with a speed of about thirty-five knots. They sacrifice almost everything to speed and carry only torpedoes and a few five-inch guns.

In modern navies it is expected that the control of the sea will be decided by conflict between squadrons of the powerful battleships and battle cruisers, which rely largely on the swift light cruisers and destroyers for information of the enemy—denying that important factor to the enemy—and for protection against attacks by enemy destroyers and submarines. They will pursue and capture enemy auxiliary ships.

Now these facts—the major importance of the capital ships and the supplementary, though highly essential, role of the light cruisers—were in the minds of the public when diplomatists and naval experts representing five great naval powers met at the Washington Limitation of Armaments Conference. And when the now famous 5-5-3 ratio was accepted to apply only to capital ships and aircraft carriers, it was generally believed that, as Earl Balfour had said, "A new era has

really begun for the whole world," because the ships that did the actual fighting were to be limited. In other words, the dread of competitive naval building programs was in some quarters thought to be abolished forever.

But it wasn't—largely because of the light cruiser.

Briefly stated, the naval treaties signed at Washington limited the size and total tonnage of capital ships—battleships and battle cruisers—and of aircraft carriers; the caliber of guns on such ships; the modifications that might be made to existing ships; the naval bases and fortifications within certain areas—notably the Western Pacific; the size, but not the number or total tonnage of light cruisers; the maximum caliber, but not the number, of the light cruisers' guns. Thus was left the opportunity for further competitive building, but with different ships from theretofore—with light cruisers and other auxiliary vessels, instead of with capital ships.

The United States had initiated the conference, and, in the opinion of many students of naval affairs, had made great sacrifices to assure its success. This country, at the end of the World War, was strong in battleships, built and building, and was prepared to carry out the Naval Appropriation Act of 1916, which called for the construction of ten first-class battleships, six battle cruisers and many smaller vessels, at a cost of $514,700,000. The United States had announced its intention to build a navy "equal to the most powerful maintained by any nation in the world." None of the

other great powers could have afforded to build so powerful and modern a navy. Great Britain had already spent some money on four of the latest type ships, which would total 172,000 tons, but their keels had not been laid. Japan was building five ships and had authorized two more, totaling 289,100 tons. Naturally all those other powers were willing then, after not unexpected protests and maneuverings, to accept the 5-5-3 ratio of limitation on capital ships and aircraft carriers.

The result was that the United States, which had been strong in capital ships, was weakened therein. It was weak already in cruisers, and because the treaty limited neither the total tonnage nor the numbers of these important craft, it remained weak in comparison to the other powers, for there was always the hope that the spirit of the conference would result in a 5-5-3 ratio applicable to cruisers and other craft.

The other powers soon saw their advantage, and today the relative cruiser strength of the three nations is far from the hoped-for 5-5-3 ratio. The United States has, built and building, a total of eighteen cruisers with a tonnage of 155,000; Japan twenty-five cruisers with a tonnage of 156,205; and Great Britain fifty-one cruisers with a tonnage of 304,290. In addition, Great Britain has appropriated the money for building three more, of 28,000 tonnage.

It may be asked why, at the Washington Conference, the numbers and total tonnage of cruisers, as well as of destroyers and other auxiliary craft, were

not limited as were those of capital ships. The answer is that treaties, like warships, are compromises. The great object of that conference was to attain some limitation of armaments and thus reduce the burden of taxation. In this it obtained a marked degree of success.

Limitation of cruiser strength was, of course, discussed at the sessions, but the subject became inextricably bound up with the problem of the submarine. France had objected to restricting the number of submarines. So had Italy. Both nations keenly felt their relegation to minor places when they accepted a ratio of 1.67 to England's and America's 5 and Japan's 3 in the matter of capital ships, and were unwilling to grant further concessions. With those two European powers potentially able to build large numbers of submarines, England insisted on her need of sufficient ships to combat a submarine menace. The light cruiser and the destroyer had proved themselves in the World War the sub's most effective enemy, and therefore neither England nor Japan would accede to limiting the number of these types of ships. Therefore, the treaty, which limited only the building of capital ships and aircraft carriers, left the door wide open for competition in light cruisers, destroyers, submarines and auxiliary vessels. This was envisaged by naval officers at the time. The General Board of the United States Navy advised the American delegates officially of this result and asserted that the treaties as finally adopted would impair the security of the United States. Par-

ticularly it had in mind the discrepancy in light cruisers, which now assumed importance because they were the largest, the most effective, of all naval craft in which unlimited building could continue—and because nations continued to build them until it became imperative again to call a halt to a senseless competition in naval building programs.

As President Harding had proposed the Washington Limitation of Armaments Conference in 1921, so, early in 1927, did President Coolidge suggest the later conference. His original proposal was that the five great powers which had been represented at Washington—the United States, Great Britain, Japan, France and Italy—all of whom were represented at an armament conference meeting at Geneva under the auspices of the League of Nations, devote themselves to the problem of curtailing their navies.

This invitation France and Italy declined, as many familiar with their attitude in naval affairs expected they would. But Great Britain and Japan accepted with apparent cordiality, and the originally planned five-power conference developed into the final tripartite gathering. Italy later promised to send an official observer to the conference.

The essence of President Coolidge's proposal was that the 5-5-3 battleship ratio for America, England and Japan be extended to include other naval craft, and that special consideration be given to naval requirements of France and Italy.

In their replies both Great Britain and Japan showed

the sensitiveness which the great powers always exhibit today whenever the subject of light cruisers is touched upon, be it done ever so delicately.

"The view of His Majesty's Government upon the special geographic position of the British Empire, the length of interimperial communications and the necessity of the protection of its food supplies are well known," ran the British reply in part, "and, together with the special conditions and requirements of the other countries invited to participate in the conversation, must be taken into account."

"The Japanese Government," contended the concluding paragraph of Japan's answer, "are further gratified to learn that it is not the intention of the American Government at this time to put forward rigid proposals on the ratios of naval strength to be maintained by the several powers in the classes of vessels not covered by the Washington Treaty. In order to insure the success of the proposed negotiations, it seems highly important that in the matter of these conditions of the limitation of armament all parties to the negotiations should approach the subject with an open mind, being always guided by the spirit of mutual accommodation and helpfulness consistent with the defensive requirements of each nation." Note well the phrase "approach the subject with an open mind."

The reason for this caution is obvious. In the Washington Conference, the United States, building the greatest navy in the world, had much to give and little to gain. In the second conference the United

States, being behind in light cruisers, had nothing to give. The sacrifices, if the 5-5-3 ratio is applied to light cruisers, must be made by Great Britain and Japan. Naturally they find reasons to oppose any move which may put them in the position of having to relinquish their present superiority. They speak of trade routes to be protected. But, it should be remembered, the rôle of the light cruiser is primarily that of a weapon in war. Its other functions may readily be performed by a limited number of such craft if peace duty is the only activity in view. Nothing came of the conference and to maintain the 5-5-3 ratio that applies to battleships, the United States needs to build immediately sixteen cruisers. Thus, a direct result of the Limitation of Armaments treaties is that the United States should build more cruisers. In a war with a power superior in cruisers it would be very difficult for our battleships, even though of equal or superior strength to the enemy, to locate that enemy and force him to battle.

Now let us seriously regard the light cruiser, considering its record as a type of warship; its purpose, its possibilities—in other words its *raison d'être.* As I have said, it is in effect a small warship which by reason of its limited tonnage and light guns cannot be considered among capital ships. Yet today, because of the conditions brought about by the Limitation of Armaments Conference, which permit the building of only those ships which do not exceed 10,000 tons, it may almost be classed as the capital ship's successor.

Certainly within recent years it has proved itself, in action as well as in discussion, a most important naval vessel. The most widely known, most dreaded of all the German raiders which spread terror along the sea lanes early in the World War were cruisers—and small ones, too. With the exception of the submarines, they wrought more damage to Allied shipping, they made the name of Germany more dreaded on the seas, they performed more daring, spectacular deeds than any branch of the German Navy, including the much-vaunted High Seas Fleet. Naval and maritime interests will long remember the damage to British and other Allied shipping wrought by the ten German cruisers that roamed the oceans in 1914 and 1915. One of the most notable of these, the *Emden,* a 3,600-ton cruiser, sank more than 68,000 tons of British commerce before being destroyed by the Australian cruiser, *Sydney.* Another, the *Moewe,* sent 154,000 tons to the bottom. The *Karlsruhe,* a light cruiser with a displacement of 4,500 tons and a crew of 373 officers and men, sank at least seventeen steamers in the Atlantic before she herself was destroyed by a violent explosion. Operating without a base, virtually without supplies except those taken from captured vessels, without opportunity to refit or to repair machinery, those ten small cruisers continued their raiding careers for months. To capture or destroy them required more than one hundred vessels of the British Navy. I know of no other type of naval vessel which would have been capable of so effective a raiding

REAR-ADMIRAL MAGRUDER, COMMANDER OF LIGHT CRUISER DIVISIONS, WITH CAPTAINS AND STAFF, 1925

program under the conditions obtaining at that time.

It was the German Pacific cruiser squadron under Admiral von Spee that dealt the heaviest blow the British fleet had suffered for a century, when it defeated a British cruiser squadron under Admiral Cradock off Coronel, Chile. The Germans, it should be pointed out, had the odds on their side. Their cruisers were more modern, better armed and faster.

It was the battle cruisers under Admiral Beatty that first saw and engaged the Germans at Jutland. Beatty was accompanied by light-cruiser squadrons, and, incidentally, the maneuvering of the Second British Light Cruiser Squadron in that battle was a splendid example of tactical scouting. Commodore Goodenough, who commanded it, gained an enviable reputation in the battle. I shall tell later of this incident.

Above all, it was the cruiser and the destroyer—which is only a very small light cruiser—that most effectively opposed the submarine menace. They performed the amazing feat of convoying more than 2,000,000 soldiers across submarine-infested seas. Of course, other types of vessels participated in this important guard duty, but the main reliance was placed on the cruiser and the destroyer.

In the days of peace which have followed the Armistice, such battleships as are permitted to the great powers engage in war games, maneuvers and practice cruises. On the other hand, light cruisers are actively engaged in necessary operations. They police the seas; they assist in political or other emergencies. As this

is written, there are light cruisers of our Navy in Nicaraguan waters and some from our own and other navies are at Shanghai and up the Yang-tse-Kiang. Such are their most important peacetime duties. In peace as in war their mobility is a great asset. In actual warfare a greater variety of duties falls to the lot of the light cruisers than to any other type of naval vessel. They protect commerce against enemy raiders, or they become raiders themselves to harass an enemy's commerce. They may be used to destroy an enemy's line of communications. When rival fleets are at a distance they are the scouts which determine the enemy's position and force, and report back to their own commander-in-chief. While engaged in scouting operations they support destroyers, submarines, airplane carriers and the smaller ships assigned to similar duty. They are particularly valuable as scouts when an enemy fleet is being closed. They go near to the opposing line, use their planes and then hasten to report the result of their observations. It is from this information that the strategy and tactics for the battle between the main fleets may be properly conceived. All these things are possible, due to their great mobility, their long radius of action, their seaworthiness and their effectiveness against all enemy ships excepting only capital ships.

These are a few of the light cruisers' functions in battle. Often they are detailed as "repeating ships"—that is, ships stationed at certain points to repeat or relay signals and instructions. It is their duty, too,

to prevent enemy cruisers, destroyers or other craft from obtaining information or interfering with the battle fleet. In a well-planned offensive this protection to the fleet is assured only when it has light cruisers present.

Very early in a battle it is the duty of the light cruisers, therefore, to destroy the enemy ships of their type or to drive them back to the protection of the fleet. If the cruisers can in this way destroy their opponent's scouts, they will greatly handicap the enemy fleet by leaving it without a reconnoissance force and therefore without adequate knowledge of the opponent's position and formation, and will at the same time deny enemy destroyers any opportunity to attack with the torpedo.

Perhaps this makes clear another reason why naval officers desire a large number of light cruisers. Since so much depends on their use in a fleet engagement, it easily may be seen that the result of a battle may depend on a superiority of light cruisers.

It is a tradition among naval commanders that a victory, to be complete, should result in the destruction or capture of all enemy craft engaged in the battle. The light cruisers may be essential to attain this.

There are self-styled strategists with superficial knowledge of the sea who maintain that, owing to advances in aviation, warships soon will become obsolete and that even now the scouting and obtaining of information may be done better by aircraft than by such surface ships as light cruisers. There can be no doubt

of the value of airplanes in a supplementary capacity, but at present they cannot supplant the light cruiser. As a congressional committee has recently pointed out, they are more vulnerable than ships; they cannot operate from territory that is not controlled by their own military or naval forces; they cannot reach distant oversea areas under their own power with effective military loads; they cannot supply themselves; they cannot cross either of the great oceans with a cargo of bombs. But, working in conjunction with the light cruiser or other vessel which carries them close to the scene of operations, they can greatly increase the value of the eyes of the fleet by extending the radius of observations. Undoubtedly they will prove their value, too, in dropping bombs and laying smoke screens. As the art of aviation develops, the tactical uses of aircraft will become more and more extensive. The aircraft of today is, however, still a fair-weather weapon, and weather is a variable factor. A fleet relying solely on aircraft for information of the enemy may at a critical moment, due to the weather, find itself without the required information. Nevertheless, the entrance of aircraft into wartime operations must of necessity modify strategical and tactical conceptions. The menace of aircraft will be met by required defensive measures to overcome that menace. This has always been the case upon the development of new weapons such as the torpedo and the submarine. The best naval opinion of today conceives the necessity for aircraft as well as for surface and subsurface craft.

LIGHT CRUISERS

The United States Navy has now actually in service ten first-class 7500-ton light cruisers. Two more are on the ways—the *Pensacola* and the *Salt Lake City*. Awards have been made for six more of the same type, but the contracts are not yet signed. Thus, of effective light cruisers built, building or authorized since 1911, we have eighteen.

In addition to her ten light cruisers now actually in service, the United States has three small vessels of the Chester class, nineteen years old, which have been out of commission for a number of years. We have also eight armored cruisers now twenty-two years old. They are less effective than certain ships which the British have scrapped. Then there are two ships of the *St. Louis* class, about twenty-two years old, five 2,200-ton cruisers of the *Galveston* class with an original speed of 16.5 knots, about twenty-four years old. These would have no value in war. Others of the older type of cruiser are the *Albany* and the *New Orleans,* which were bought during the Spanish-American War, and the *Olympia,* Dewey's flagship at Manila, which was launched back in 1894. Finally there is the thirty-four-year-old *Rochester,* formerly the *New York,* which was Sampson's flagship at Santiago.

Our modern cruisers are in what is known as the *Richmond* class, so called because they duplicate the *Richmond.* They are, first, the *Richmond,* then the *Omaha,* the *Milwaukee,* the *Cincinnati,* the *Raleigh,* the *Detroit,* the *Concord,* the *Trenton,* the *Marblehead* and the *Memphis.* Eight of these formed two divisions

called the light-cruiser divisions, which it was my privilege to command for more than two years. The *Omaha* and the *Concord* are flagships of destroyer squadrons in the Pacific and Atlantic fleets respectively.

The flagship was the *Richmond.* To describe it would be to describe this class of light cruisers. The *Richmond,* then, like its sister ships, is a fast, oil-burning, light cruiser, 555 feet in length, 55 feet beam on the water line. When fully equipped and ready for sea with a normal load of stores, ammunition and fuel, it has a normal displacement of 7500 tons; 2500 tons under the maximum allowed by the treaty. Thus loaded its mean draft is fourteen feet three inches, and its speed 34 knots. Since knots means nautical miles an hour and a nautical mile is somewhat longer than a land mile, this means an actual speed of thirty-nine miles an hour! This speed is developed by turbines generating 100,000 horse power and driving four propellers. Its twelve oil-burning boilers have a total heating area of 90,840 square feet. Apart from furnishing the motive power, the boilers furnish steam for electric turbo-generating sets to supply energy for almost every operation on the vessel, from elevating guns and operating the rudder to beating eggs into omelets. The total weight of all this machinery exceeds 1500 tons, and to operate it about 2000 tons of oil may be carried. With this supply the *Richmond* can, without refueling, steam for forty successive days, traveling halfway around the earth. If she proceeds at full speed she can steam only for a few days on that fuel supply

and only one-sixth the distance. With three boilers developing one-fourth of her horse power, the vessel can make about seventeen knots; on six of her boilers, developing one-half of her horse power, she can make about twenty-six knots. To get her maximum speed—thirty-four knots—she must use six more boilers, or all twelve of them, although the difference in speed is only eight knots. That explains why her maximum speed is resorted to only in emergencies. Steaming at high speeds is uneconomical and very expensive.

The *Richmond,* like her sister ships, is unarmored, but is well armed with both guns and torpedoes. She has a main battery of twelve six-inch, fifty-three-caliber guns, and four three-inch, fifty-caliber secondary battery guns. She carries two twenty-one-inch triple torpedo tubes and two twenty-one-inch twin torpedo tubes.

The *Richmond* can deliver a broadside from eight six-inch guns and two torpedo tubes. The guns are not protected, but on either side of them is a light splinterproof shield to protect gun pointers and sight setters. Six hoists feed her guns with ammunition.

These cruisers are modern craft. Therefore they carry airplanes. Between the fourth funnel and the mainmast on each cruiser are stowed two seaplanes. Obviously there is not room on deck for the plane to develop sufficient speed to take off, even if it were equipped with wheels. To hoist such a plane overboard is a hazardous proceeding, impossible while the ship is under way or in a rough sea. Therefore the

Richmond and her sister ships are equipped with catapults which project the plane forward and into the air with enough initial speed for immediate flight.

To run this complex machine, to man the guns, to groom and fly the airplanes, the *Richmond* carries a complement of about 460 officers and men. Nineteen of these are wardroom officers, ten are warrant officers, twenty-nine are chief petty officers, and 400 are other enlisted men. Among adventurous spirits the light cruisers are popular ships. The commanders hold the rank of captain, but, because the complement of officers is smaller than on the battleships, there is opportunity for the younger officers to hold more responsible positions. There may be also greater opportunity for travel and adventure on them, for the cruiser may be dispatched to distant shores to protect commerce or our national interests, while the battleship remains in home waters. In time of war the light cruiser will be among the first in battle.

The work, the duties, the recreations of the crew are much the same as on the battleships. Life on a light cruiser means hard work and limited accommodations for officers and men. It is above all, from a seamen's point of view, an interesting and exciting life.

By the treaty of Washington the naval powers are permitted to build light cruisers of 10,000 tons. At the present time, of these so-called "Washington cruisers" there are built and building by the British 17; by Japan 8, and by the United States 8. These cruisers mount 8 or 10 eight-inch guns and have a speed of

about 32.5 knots. They are ships about 700 feet long and 70 feet beam. They are a very powerful type of cruiser and should be capable of great service in war.

The light cruiser, whether frigate in the days of the sail, or oil burner in the days of steam, has played a prominent rôle in the history of the American Navy. It was an eighteen-gun frigate, the *Ranger,* that received the first salute to the Stars and Stripes in Europe, when Captain John Paul Jones sailed it into Quiberon Bay, France, in 1778. It was a frigate, the *Constitution,* forerunner of our light cruisers, which served gallantly at Tripoli and elsewhere and inspired one of America's most patriotic poems. The *Constellation,* sister ship to the *Constitution,* defeated a squadron of nine Tripolitan gunboats. In a frigate, the *Essex,* Captain Porter captured the British sloop *Alert* in the first naval action of the War of 1812. It was in the U. S. Frigate, *San Jacinto,* that Captain Wilkes removed the Confederate commissioners from the steamer *Trent* in that historic episode of the Civil War. Incidentally the famous Confederate raider *Alabama* belonged to the frigate-cruiser class, and, as everyone knows, Dewey's squadron at Manila was composed of cruisers.

The modern employment of light cruisers was most graphically illustrated by the operations of the British and German light cruisers during the World War. The employment of the cruisers of these two nations was very similar and in accordance with sound principles of strategy and tactics.

The opposing fleets, in operating in the North Sea, were invariably accompanied and preceded by squadrons of light cruisers for the purpose of protecting the capital ships from attacks by submarines and destroyers, and also for scouting.

The British maintained a squadron of light cruisers based on Harwich. This squadron, under the command of Commodore Reginald Tyrwhitt, was extremely useful in preventing raiding attacks by German light cruisers and destroyer squadrons on the East Coast towns of England. They were so ably handled that Commodore Tyrwhitt was promoted to rear admiral and is now a vice admiral and British commander-in-chief in Chinese waters.

It was a squadron of light cruisers that gave Admiral Beatty information about the enemy that led to the action of Dogger Bank, which was a success for the British.

In the great naval battle of Jutland the light-cruiser squadrons of both sides distinguished themselves, and their employment in that battle enables one to visualize, naturally, their employment in a future naval battle.

It may be remembered that the Battle of Jutland began by an engagement between two squadrons of battle cruisers accompanied by light-cruiser squadrons and flotillas of destroyers under the command of Vice Admiral Beatty and Vice Admiral Von Hipper. The light cruiser *Galatea,* flagship of the First Light Cruiser Squadron, first sighted Admiral Von Hipper's squad-

ron. Soon the *Galatea* had sighted several German light cruisers and destroyers and was forced to turn toward Admiral Beatty's cruisers for support.

At the beginning of the battle between the battle cruisers, the Second Light Cruiser Squadron, under Commodore Goodenough, was stationed on the engaged bow of the *Lion,* Admiral Beatty's flagship, and was about 13,500 yards from the leading enemy battle cruisers. While in this relative position the *Nottingham* sighted the German main body and stood for the enemy for the purpose of reporting the position and formation to the British commander-in-chief, Admiral Jellicoe. Upon reporting the position and composition of the enemy, the Second Light Cruiser Squadron turned to follow the light cruisers which had previously been forced to turn away from the German battleships. In order to get this information the light-cruiser squadron was forced to approach so near the enemy that soon it was under fire from several enemy battleships. For half an hour these cruisers were under fire, and salvo after salvo of eleven-inch shells fell near them, but in view of their speed and zigzagging not one was struck, although the gunnery of the Germans was excellent.

During the Battle of Jutland there were several destroyer attacks by both sides. None of these was successful, for when the destroyers stood to make their attack a counter attack was made by enemy destroyers and light cruisers, and almost invariably prevented the attacking destroyers from getting within torpedo range.

Although many light cruisers were under heavy fire during this great battle, comparatively few casualties took place among them, due to their speed and handiness. These incidents demonstrate the importance of the light cruiser in battle. They demonstrate, also, the necessity for our nation to stand on a parity with any other in this element of naval strength.

The first line of defense is not the Navy. It is diplomacy, and diplomacy includes such conferences on the limitation of armaments as the one in Washington six years ago and the one held at Geneva in 1927.

III

DESTROYERS

THAT the United States Navy is urgently in need of more light cruisers is obvious. Great Britain has built, building and appropriated for, fifty-nine of these very useful warships, totaling 350,000 tons, while the United States has only eighteen, totaling 155,000 tons—a difference of 195,000 tons. Of the cruisers built, building and appropriated for, for the United States, only ten are completed; the remaining eight will probably not be completed for another three years. It would not be reasonable to propose that we build immediately thirty or more 10,000-ton cruisers to offset this disparity in tonnage. Building programs necessarily have to be distributed over a period of years for economic as well as political reasons. Great Britain finds a need for many small cruisers of a type not suited to our strategic requirements. Since these small cruisers have limited cruising radius and are not sufficiently useful to us in defensive operations, we are compelled to build larger cruisers of great cruising radius and maximum power for defense. The interrelation of these two policies makes it obvious that the United States would not need as

many of the larger type of cruiser as Great Britain does of the large and small types combined. Each country will naturally build cruisers of the type suited to meet its particular strategic requirements, and will desire to build in numbers to provide reasonable security.

The United States Navy has today 276 first-class destroyers, ranging from 1000 to 1500 tons each, and totaling 330,000 tons. Great Britain has 153 destroyers of 1000 to 1500 tons and eighteen flotilla leaders—larger destroyers—of from 1610 to 1800 tons. This superiority of the United States Navy in destroyers was not premeditated. It came as a sequence of the World War. In that conflict the great menace to the Allies was the German submarine. As the destroyer was the best reply to the menace, the United States, by prodigious effort, built in a few years no less than 260 modern and effective vessels of that type and thus gained the outstanding superiority that now exists.

Although the cruiser and the destroyer differ in size and in power, they have certain characteristics in common. The destroyer has gradually increased in size due to the demands for longer radius of action and greater offensive power until in the destroyer leader it approaches the light cruiser. But their characteristics have this essential difference—that the primary weapon of the destroyer is the torpedo, whereas that of the light

cruiser is the gun. Destroyers may, however, in wartime perform many of the duties usually assigned to light cruisers. They may act to a limited extent as scouts, or effective anti-submarine screens around capital ships. In tactical maneuvers they may be used, as are light cruisers, in torpedo attacks against enemy ships or in countering a similar offensive by the foe. Under favorable conditions they may lay a smoke screen to hide from the enemy all knowledge of the fleet maneuvers. Their effectiveness in such tactics was demonstrated in the Battle of Jutland, when the German destroyers' torpedo attacks and smoke screen enabled Vice Admiral Scheer to avoid decisive battle against a superior British fleet after inflicting damage to the British fleet far greater than that received by the German fleet.

Yet it must never be forgotten that the light cruiser has certain strategical and tactical advantages which the destroyer lacks. The cruiser can, with its great speed and heavier guns, overhaul and easily sink a destroyer. Of these 10,000-ton cruisers, Great Britain has eighteen built and appropriated for and the United States eight, the other forty-one British and ten American vessels being of lesser tonnage.

To equal Great Britain numerically in light cruisers of latest, or 10,000-ton type, it would be necessary, therefore, for the United States to build at once ten more cruisers of the 10,000-ton

class, armed with eight-inch guns. Then, counting the ten smaller cruisers already built, we would have in numbers only twenty-eight light cruisers against fifty-four of Great Britain. That is, I believe, not sufficiently close in light-cruiser parity and does not meet adequately the requirements of a well-rounded fleet as regards that element of naval strength. Particularly will this be so, provided the United States does not build very-much-needed destroyer leaders. In other elements a difference will remain. There never were and there never will be two nations having absolutely equal power on the sea.

Should the United States attempt to build as many light cruisers as Great Britain now has and determine that replacements of capital ships should be made as provided for by the Washington treaties it would mean the expenditure in the next decade of billions of dollars. Of course, this expenditure could be spread over a number of years and, in view of the enormous wealth of the country, there would be no financial strain in so doing. Yet, after careful consideration of all the elements of sea power, I am of the opinion that the interests of the United States may be conserved and expenditures lessened, provided each element of sea power is considered individually and an attempt is made to evaluate the various elements to the end that the United States may have a sea power adequate to its needs without attempting to build in competition with any

other power. It is for that reason that I believe an adequate sea power for the United States may be attained by taking into consideration every element that goes to make sea power, with no effort for competitive building, and by a moderate program for building additional light cruisers, submarines and ten or fifteen destroyer leaders, and —this is of the greatest importance—by building up the merchant marine.

There is, for the taxpayers of the United States, a certain economical advantage in this situation. The cost of a 10,000-ton, thirty-four-knot light cruiser, including armament and equipage, is about $16,000,000. Assuming for the vessel a life of twenty years, the annual cost of operation, deterioration and interest on the investment, will total about $3,000,000. Since the merchant marine of the United States is much in need of fast modern up-to-date freight and passenger steamers, it is the part of national economy to provide such numbers of these as are needed and insure that they are fast enough and so constructed as in time of national emergency to be quickly and easily converted into light cruisers. The savings effected by such a policy will be very, very large.

It must be clearly understood that when I suggest building at once ten new 10,000-ton light cruisers for the Navy I consider that as the minimum requirement as a beginning to attain such cruiser strength as is needed by the Navy of the United States.

There is no more interesting class of warship than the destroyers with which America now finds herself so generously supplied. They developed in response to a comparatively recent need. Thus, briefly, runs their history:

About forty years ago the automobile torpedo was perfected. This torpedo, with a large charge of high explosive, was at first carried on very small fast boats, appropriately called torpedo boats. The size of the boats increased gradually as competition arose between the naval powers, until they were built to displace several hundred tons. Then, to combat them, larger vessels, also armed with torpedoes, were constructed. These were called torpedo-boat destroyers, or, as they are more familiarly known today, destroyers.

The modern destroyer is a vessel of from 1000 to 1,500 tons, carrying torpedo tubes, four to five-inch guns, depth charges and from two to four triple-torpedo tubes. Its speed is from thirty to thirty-five knots, which may mean a maximum of forty statute miles an hour. The torpedoes it carries are charged with several hundred pounds of high explosive and have a range of about 12,000 yards at a mean speed of about thirty knots. The accuracy of these torpedoes is remarkable. A barrage by an attack squadron, driven home, cannot be dodged. In war the armament includes the destructive depth bomb. Such bombs are carried in runways sloping to the stern. When a sub-

marine is attacked the bombs are released one at a time, with fuses so set that the detonation shall take place as near to the estimated depth and position of the submarine as possible. During the war a short gun was developed to throw depth bombs to a distance of from 80 to 100 yards in encounters where it was not possible to maneuver the destroyer over the position of the U-boat. There is no armor on the destroyer for protection against superiority in gunfire. To escape destruction it must rely on speed and ability to maneuver quickly. In its design virtually everything is sacrificed to attain great speed.

The fuel-oil tanks of a destroyer hold about 100,000 gallons. With this they can steam at full power, approximately at a thirty-knot speed, for about 1000 miles. This is, of course, a very small radius of action, for destroyers employed in scouting must always have enough fuel to return to a base or to a source of supply. When destroyers are employed strategically it may at any time become necessary to concentrate them for tactical use in an engagement between capital ships, and to be useful in battle they must have fuel sufficient to steam at maximum speed for ten or twelve hours. A destroyer can be employed strategically using one-half of her fuel supply. Steaming at different speeds a destroyer may be used strategically for varying lengths of time. For example, if the speed is fifteen knots a destroyer may scout

five days; at twenty knots three and a half days; at twenty-five knots one and three-quarters days. These figures are, of course, approximate; they vary for every destroyer. This, of course, is not endurance sufficient for any extended movements either overseas or for scouting. However, it is possible to refuel destroyers at sea from tankers. Fine seamanship is required to place a destroyer almost alongside a tanker without a collision. When the hose from the tanker is on the destroyer, they can both steam, weather permitting, in any desired direction at a slow speed—about eight knots. The only obstacle to refueling destroyers at sea is rough weather. Tersely put, a destroyer with tanks full of oil can cruise twenty-four days at ten knots, but only about twenty-four hours at maximum speed.

A very large part of the destroyer's area is filled with vital and vulnerable machinery. The firerooms and engine rooms cover a space of more than one-half the vessel's length. Any shell exploding within this area will at once reduce the speed 50 per cent, if it does not put the ship out of action. During the Battle of Jutland a British destroyer was struck by a salvo of three eleven-inch shells, but the only result was to put one fireroom out of commission and reduce the speed from thirty knots to about twenty knots. The destroyer is not what sailors call a good "sea boat." In a rough sea it rolls deeply, and is

most uncomfortable for the personnel. On one destroyer, after a forty-eight-hour gale in the Bay of Biscay, which is notorious for its rough seas, a young officer came down to dinner for the first time in several days and tried to eat. The effort was unsuccessful. The officer started up the ladder, then turned to address his commander.

"Captain," he said with great earnestness, "I am beginning to feel that I don't much care whether the world is safe for democracy or not." Then he fled.

Because of lightness of structure the destroyer cannot be driven into head seas at high speed without danger of buckling the plates or even bending the bow. It is, however, entirely seaworthy and when properly handled can weather any gale. It can steam into a moderate sea at a speed of about twenty knots, which is approximately battle speed; destroyers can therefore accompany a battle fleet in almost any weather.

A typical destroyer of the United States Navy is the *Conyngham,* a vessel 310 feet long, 30 feet beam, with a mean draft of about 10 feet. The ship has turbine engines with four water-tube boilers developing about 20,000 horse power. The machinery also includes two electric turbo-generator sets, with an output of twenty-five kilowatts each. The machinery accounts for almost one-third the total weight of the ship and fuel oil for about one-fourth. In order to man the

Conyngham, 8 officers and 114 enlisted men are required. The officer in command has usually the rank of commander. He has an executive officer, two engineers, a navigating and gunnery officer and three watch officers. For each division of six destroyers a medical officer and a supply officer are detailed.

Formerly in the United States service the senior captain led and commanded a division. Now, however, an officer is especially detailed as division commander. He has nothing to do with the handling or internal administration of any individual ship. Should the destroyers now out of commission be reconditioned again and recommissioned, there doubtless will be a reversion to the former system.

A squadron of destroyers is composed of three divisions of six destroyers each, with a squadron leader and a tender for each squadron. The squadron commander, a staff of two or three officers, personnel for communications and administration must be provided quarters on the squadron leader. The squadron tender can be used for some of this work. Yet the squadron commander and his staff must now be quartered on a destroyer. Because this crowds the average ship, naval powers, other than the United States, have built very large destroyers to act as destroyer leaders. These are vessels of from 1800 to 2000 tons; they have a speed of about thirty-four knots

and carry a battery of four to six five-inch guns. There is great need for leaders for the United States squadrons. With 276 first-class destroyers, we require about twelve squadron leaders. These should be constructed as soon as is practicable. They are much needed if the United States is to have a well-balanced fleet. It should never be forgotten that when new ships are built personnel must be provided to man them.

Experience gained in the World War showed the great value of destroyers in naval campaigns. It was demonstrated, for example, that when at sea each division of battleships must have a division of destroyers for an anti-submarine screen. These two divisions form, in a way, a tactical unit. The commander of each battleship division should command and train the division and screen as a unit.

In a battle between fleets, divisions of destroyers are deployed ahead of the battle line of capital ships to attack the enemy when opportunity offers, or to frustrate enemy destroyer attacks. It is essential for light cruisers to co-operate with destroyers in supporting their attacks by defending them from enemy light cruisers or by preventing interference with the attack by enemy destroyers. The light cruisers and destroyers thus working together are called light forces.

Action in battle, however, is only one method of employing destroyers. During the war they served many purposes—scouting, patrolling against submarines and against one another, convoying transports, and the like. Probably the greatest value of the American destroyers to the Allies during the war lay in their escort service. Many an American soldier gave a sigh of relief when he awakened one fine morning near the coast of France to find his ship escorted by friendly destroyers, while the cruisers which had crossed the wide ocean with it dashed back to a home port. A submarine would have difficulty sinking a troopship thus protected. Of course destroyers protect a convoy from only submarines and enemy destroyers. They are no protection against light cruisers.

It was in the great naval Battle of Jutland that destroyers proved their value from every tactical point of view. The battle opened with a running fight between six British and five German battle cruisers. In less than forty minutes two British battle cruisers were sunk by gunfire and a third severely damaged. To aid the distressed British battle cruisers, twelve destroyers advanced in an attack on the German battle cruisers. Then, to counter this attack, a German light cruiser and fifteen destroyers dashed through the German column and a battle took place at close range. The torpedo attacks were frustrated and two

DESTROYERS OUT OF COMMISSION, NAVY YARD, PHILADELPHIA

destroyers on each side were sunk. A noteworthy feature was the demonstrated ability of destroyers to remain in action after suffering great damage from gunfire. During the many activities in which seventy-two German and eighty British destroyers were engaged, the British lost seven and the Germans only five destroyers. On both sides the destroyers were maneuvered with skill, dash and the utmost courage.

The adventures that may befall destroyers in battle—particularly in a night action—may be visualized by a brief description of what happened to the Fourth Flotilla of the British Fleet one night in that battle. This flotilla was composed of the *Tipperary,* a flotilla leader, and eighteen destroyers. Of the seven destroyers sunk in the battle, five belonged to this flotilla.

On the afternoon of May 31st four destroyers of the flotilla, including the *Shark* and the *Acasta,* were detailed to screen the Third Cruiser Squadron. The weather was misty and it was quite difficult to see the enemy's ships. However, at about six o'clock in the evening, part of the enemy's fleet was sighted, and Commander Loftus Jones of the *Shark* proceeded at once to attack. At the same time several German light cruisers and destroyers started a torpedo attack on the British Third Battle Cruiser Squadron and as a result the English destroyers were soon battling with German light cruisers and destroyers. How

bitter that fighting was may be illustrated by the experience of the *Shark*. In the attack this destroyer was damaged by gunfire. The British boats, seeing the enemy offensive broken up, turned to rejoin the battle cruisers while the crippled *Shark* remained behind. As newcomers among the German vessels appeared they opened a heavy fire on the *Shark*, causing many casualties and wounding Commander Jones.

The destroyer *Acasta* came to assist, but Commander Jones ordered it away. One gun and one torpedo were left on the *Shark*. While the torpedo was being loaded it was exploded by a shell and many of the crew were killed. The surviving officers and men heroically continued to fight with the one gun in action. Again the captain was wounded, his left leg being blown off by a shell. Despite this, he continued to direct the fire until the condition of the *Shark* and the approach of enemy destroyers made it impossible for the ship to escape falling into enemy hands. Commander Jones then gave the order to sink the ship, only to countermand it when he learned the single gun still could be used. A moment later two torpedoes struck the *Shark* and the gallant ship went down with colors flying.

Six survivors were picked up next day by a Danish steamer. Commander Jones was awarded posthumously the Victoria Cross, the most prized of all British decorations. Well had he earned it!

Later in the engagement the *Acasta* was struck in the engine room by two large shells and the ship was disabled just in the path of the British main fleet. It succeeded in making repairs which allowed it to steam at three or four knots and finally reach port.

After the day battle the remaining ships of the Fourth Flotilla were stationed about five miles astern of the British battleships and were steaming south in column at seventeen knots speed. At about 11:30 o'clock in the evening three vessels were sighted. It was impossible to determine whether they were friends or enemies. They passed the destroyers slowly, and when the leading ship was abeam of the *Tipperary,* that vessel issued a challenge. Immediately the three ships switched on searchlights and opened a deadly fire on the leading destroyer. Every salvo found its target. The first salvo killed the captain and everyone on the *Tipperary's* bridge. Three more salvos struck the ship and she lay helpless and was doomed. For two hours the *Tipperary* burned fiercely; then she sank. Eleven officers and 176 men were lost. When the ship went down about thirty men and one officer were on a light raft. Eight other men were picked up by a German vessel and made prisoners of war.

Next astern of the *Tipperary* was the destroyer *Spitfire.* This vessel opened fire and fired a torpedo before turning away from the enemy. At

this moment the *Spitfire* was struck by a salvo of eight-inch shells. The vessel was soon clear of the action, but seeing the *Tipperary* on fire, decided to return to render assistance, and as the *Tipperary* was neared, a German cruiser was seen suddenly bearing down on the *Spitfire,* apparently with the intention to ram. The two ships met end-on, the destroyer steaming at twenty-seven knots and the cruiser probably about twenty knots. They came together port bow to port bow with a terrific crash. The German cruiser opened fire, but could not depress the guns to get a hit. The blast of the guns, however, was so terrific that it cleared the destroyer's decks. The foremast and the forward funnel were blown down by the blast and fires were started in the forward part of the ship. Two shells had struck the ship just before the collision, wrecking the bridge and killing everyone on it except the coxswain and two men. The ships soon cleared each other and the cruiser disappeared in the darkness. A shell had passed close to the captain's head, cutting open the scalp, and the blast of it had hurled him from the bridge to the upper deck, a distance of twenty-four feet.

Soon afterward there appeared, a few hundred yards away, a large cruiser on fire, fore and aft, steering straight for the *Spitfire.* A collision seemed inevitable, but fortunately it was avoided by a few feet. Shortly after, the cruiser disap-

peared and a terrific explosion was heard in the direction in which it had gone. It was the unfortunate *Black Prince.* As a result of this action the flotilla was dispersed in confusion. The *Broke,* the second leader, collected six of the ships and started to regain station when, at about 12:15 o'clock, the flotilla sighted an enemy battleship close by. Both the *Broke* and the stranger challenged. Immediately the *Broke* was in a blaze of searchlights and the enemy opened a rapid fire. One officer and forty-six men of the *Broke* were killed and three officers and thirty-three men wounded. The engine-room telegraphs had been shot away, but the machinery was intact.

Soon the enemy searchlights were out and the *Broke* left in darkness. Suddenly another ship loomed up dead ahead, and then, with a terrific crash, the *Broke* struck the destroyer *Sparrowhawk* just forward of the bridge and made such a cut in the ship that the bow broke off and floated away. The shock of the collision threw a lieutenant and some men of the *Sparrowhawk* over on board the *Broke.* As the *Broke* steamed astern to get clear of the *Sparrowhawk,* another destroyer, the *Contest,* suddenly appeared out of the darkness and crashed into and cut off about fifteen feet of the *Sparrowhawk's* stern. An attempt was made later to tow the *Sparrowhawk* to port, but owing to increasing wind and sea, it became necessary to sink the *Sparrowhawk* the following morning.

The *Broke* and accompanying destroyers had run into four German battleships, one after another. The battleships picked up the destroyers with their searchlights and opened fire. The fourth ship in the column, the *Fortune,* was blown almost to pieces. There was not a single survivor from this ship. The third ship in the column was the *Ardent,* of whose crew there were only two survivors, one the captain. The narrative of the captain is a thrilling story of adventure. After his vessel sank he was picked up the following day floating, unconscious, in a life buoy.

The record made by United States destroyers in the World War is one of which the Navy is justly proud. In the war zone they steamed from 5000 to 7000 miles a month. At the end of the war there were about seventy-five destroyers in European waters. Only one or two had to be sent to the United States for extensive repairs, and among these destroyers were some of the smallest and oldest on the Navy list.

As everyone knows, the destroyers constituted one of our greatest contributions to victory, and were an important factor in frustrating the German submarine menace, which had assumed serious proportions. In May of 1917, only a few weeks after America had entered the war, six American destroyers under Commander J. K. Taussig dropped anchor off Queenstown. Their

arrival did much to encourage the Allies, who referred to it as "the return of the *Mayflower*." In the Proceedings of the Naval Institute for December, 1922, is an interesting description of the meeting between Commander Taussig and Admiral Bayly of the Royal Navy.

They exchanged the usual formalities and then Admiral Bayly asked: "Commander Taussig, at what time will your vessels be ready for sea?"

"I shall be ready when fueled," was the reply.

"Do you need any repairs?" asked the admiral.

"No, sir," said Taussig.

"Do you need any stores?"

"No, sir. Each vessel now has on stores sufficient to last seventy days."

The admiral was greatly pleased by this evidence of preparedness and effectiveness on the part of the light ships that had just crossed the wide Atlantic.

"You will take four days' rest," he said. "Good morning."

By May seventeenth a second division of six destroyers had arrived, and before the middle of July thirty-four of these American ships were operating out of Queenstown. They followed a rigorous routine consisting of six days of patrol, then two days in port, with five days off for boiler cleaning and overhauling once a month.

Only men who have served on destroyers can know the hardships of the work. The ships

answered calls for help from victims of the submarine, picked up survivors, met the transports in dangerous areas close to their ports and escorted them in, and hunted constantly for submarines, which they attacked by ramming, by gunfire, or with depth bombs.

Their most effective service was the escorting of convoys of troopships and merchant ships. In all kinds of weather, rough seas and smooth, in rain and fog, destroyer escorts met the convoys, formed an anti-submarine screen, and zigzagging ahead of the convoys, effectually protected our transports and cargo ships. That not a single troopship escorted by our destroyers was sunk is the greatest tribute that can be paid to the naval officers commanding destroyers in the war zone.

There are, among the records of these wartime destroyers, stirring examples of both courage and extraordinary seamanship. The story of the destroyer *Shaw* is one of them. This vessel was escorting transports through a submarine-infested area when, early one morning, the steering wheel jammed. When this occurred she was heading directly for the *Aquitania,* laden with troops. Had she rammed the liner it might have been sunk. Commander Glassford of the *Shaw* realized this. Quickly he ordered, "Full speed astern." With terrific strain the engines were reversed, swinging the *Shaw* off her course. She avoided ramming the *Aquitania,* but in so doing, ran directly under the huge steamer's stern and

DESTROYERS ATTACKING, ASSISTED BY LIGHT CRUISERS AND AIRPLANES

DESTROYERS, PROTECTED BY LIGHT CRUISERS, ATTACKING BY DIVISIONS

her bow cut away. Two officers and ten men were killed. The bow of the destroyer drifted away. What was left caught fire as the oil tanks were ignited. But officers and crew quenched the flames, refused assistance and backed the damaged vessel, saved from sinking by her water-tight compartments, safely into port.

The engagement between the destroyer *Fanning,* commanded by Lieutenant A. S. Carpender, and the U-58 in November of 1917 is another thrilling tale. With the *Nicholson,* the *Fanning* was guarding a convoy of eight British merchant ships near Queenstown when a submarine was sighted. Immediately the *Fanning* charged in an attempt to ram it, but the submarine submerged in time. The *Fanning* dropped a depth charge and turned just as the submarine emerged again. A second depth charge and some shots from the stern gun brought the submarine crew on deck to surrender.

While the *Nicholson* stood by, prepared to fire in case of treachery, the *Fanning* picked up the four officers and thirty-five men of the crew just before the submarine sank. Two of the American enlisted men actually leaped into the cold water to save a German sailor who was drowning. The depth bomb had put the U-58 out of commission and it had been necessary for the crew to blow the tanks and come to the surface to be saved from perishing under the sea.

The *Nicholson* figured in another interesting and typical adventure. One morning in October, 1917, she answered a call for help from the American merchantman *J. L. Luckenback,* which had been attacked by gunfire from a submarine. The *Luckenback* was defending herself with guns on deck.

"Do not surrender," radioed the *Nicholson* as it steamed to the rescue.

"Never," was the courageous reply carried back through the air. The *Nicholson* arrived in time to save the merchantman and convoyed her safely into port.

Apart from their extraordinary service in convoy work, the American destroyers and their crews participated in many heroic exploits. One of the most daring of these occurred on April 17, 1918, in Quiberon Bay. That night shortly after eleven o'clock the *Florence H.,* a vessel of a convoy there, burst into flames. The ship was loaded with tons of smokeless powder, which burned fiercely. An explosion followed, throwing cases of powder into the sea, and soon the surrounding water was covered with burning boxes of powder. To save themselves, members of the crew of the *Florence H.* were forced to jump overboard. Sister vessels sent boats to rescue the survivors, but could not pass the burning powder to reach them. All would have been lost but for the destroyer *Stewart,* commanded by Lieutenant Commander H. S. Haislip, which steamed into the sea of flame, and rescued many at great risk that the ship would be set afire and destroyed. Despite

the danger of fire and destruction which it faced, the *Stewart* escaped with but little damage.

The name of Destroyer 255—the *Osmond Ingram*—commemorates another example of heroism on the part of a member of a destroyer crew during the war. It honors Osmond Kelley Ingram, first-class gunner's mate, who was killed when his ship, the destroyer *Cassin,* was torpedoed in European waters on October 15, 1917. Ingram saw the torpedo coming from a German submarine toward the stern of the *Cassin.* He realized that if the torpedo struck the ship near the place where the high explosives were stored the vessel would be blown up. Instead of seeking safety, he rushed aft to throw the depth charges overboard before the torpedo reached the ship. While doing this the torpedo struck the ship and Ingram was blown overboard himself. His body was never recovered. He sacrificed his life to save his ship and shipmates. Truly a heroic action. Although the *Cassin* was struck by the torpedo, she kept afloat and drove off the submarine when it came to the surface to attack her with guns. Then, despite stormy weather, and with the assistance of other vessels, she reached port.

After the German High Seas Fleet surrendered in November, 1918, American destroyers continued to give much valuable service. In the Mediterranean, the Black Sea and the Baltic they worked with cruisers in the distribution of food

supplies and clothing to starving Russians. It was there that the crew of the destroyer *Childs* adopted and arranged for the maintenance of forty Russian children. In September of 1922, when fire destroyed the Greek and Armenian sections of Smyrna, an American destroyer picked up no less than 670 persons from the waterside and from the water itself. Our destroyers then took the lead in helping 260,000 refugees and arranging for their evacuation to Greece under naval protection. In December of that same year the destroyer *Bainbridge* made a notable rescue in the Sea of Marmora. When the French transport *Vinh-Long* caught fire, the *Bainbridge* went alongside, and, despite a panic and a series of explosions, rescued 482 persons and carried them to Constantinople. In September of 1923, when seven United States destroyers were wrecked on the coast of California during a fog at night, the crews gave a remarkable demonstration of the quality of naval discipline, as a result of which only twenty-two men were lost.

In diplomacy as well as in war, the destroyer has figured prominently. At the Washington Conference for the Limitation of Armaments the French refused to have any ratio applied to submarines. At once the British refused to have a ratio applied to destroyers, because the destroyer is the most efficient weapon to use against the U-boats. During the Tripartite Geneva Conference of last year, the naval experts of the powers

party to the conference had a tentative discussion and agreement fixing the size of destroyers. This was to have been 1500 standard tons for destroyers and 1850 standard tons for destroyer leaders.

At the time of the Geneva Conference much misinformation disseminated. I read, for example, one account which stated that 176 destroyers were built in a month's time ten years ago when American entered the World War. It added that the destroyers now out of commission are without funnels, torpedo tubes, guns and parts of engines, and going to rust. This is, of course, quite inaccurate. It is true destroyers deteriorate when not in active service. The only way to have them ready for war is to keep them in active commission. Nevertheless, the United States destroyers out of commission are preserved as much as limited funds permit. Much of the material becomes obsolescent. There is no doubt, however, that, if the necessary funds are made available, the destroyers can be put in a condition for many years more service. The life of a destroyer has been variously estimated as being from twelve to twenty-four years. At the Geneva Conference it was suggested and approved that replacement could take place after sixteen years. This is probably as good an estimate as any for the life of a destroyer. The life of any vessel depends upon the care that is bestowed upon it. Apart from many other advantages, here is an excellent reason for keep-

ing all our destroyers in active service. Their years of service are thereby prolonged. But this requires a large increase in the enlisted personnel.

In the wars of the past the destroyer has played an important and spectacular part. In the next war, due to limitation of the numbers of capital ships, the destroyer may have even a greater influence in the final decision of a war.

SUBMARINES

IN modern warfare there lurks, wherever ships may travel, a strong and invisible enemy. It is the submarine. In modern diplomacy there waits, wherever conferences may lead, the same potential force—still strong, still largely invisible. The talk may be of battleships and cruisers, of aircraft or of gun elevations, or of armed and distant bases, but deep beneath the surface of it all runs the question: What of the submarine?

Twice within the past five years has this wartime menace of the seas shown its power at peacetime conferences ashore. At the Limitation of Armament Conference in Washington, in 1922, it figured in the results to a far greater degree than was suspected. At the 1927 conference in Geneva it was the force, subtly mysterious and seldom discussed, that prompted the urge for more cruisers. Thus, in the sessions at Washington, Great Britain was strongly in favor of abolishing the submarine as a weapon to be used in warfare. This attitude was dictated by the fact that England's trade routes are extensive and diverge to all points of the compass, and that the more important of them pass close to those continental nations which have great interests in the Mediterranean. France, on the other hand, resolutely opposed any limitation

of the submarine and was successful in preventing its abolition.

In the end, the British succeeded in having adopted a provision in a treaty to the effect that submarines should not be used as commerce destroyers after ratification of the treaty by the five contracting powers. This treaty was ratified by all the nations at the conference except France.

Immediately after the conference France undertook a submarine building program that increased gradually from 1922, when she had only 1000 tons under construction, until January 1, 1927, when she had 25,000 tons building. Italy began construction of submarines in 1925. On the first of January, 1926, Italy was building 5000 tons of submarines, and on the first of last January 12,000 tons. Since cruisers are admirably designed to protect merchant convoys and to combat the submarine, one may now better understand the English desire—expressed at the recent Geneva conference—for a large number of small cruisers rather than a smaller number of large cruisers. Thus, it was the invisible power of the submarine that in part caused the failure of the 1927 conference on naval armament, and this failure in turn was a reaction from the 1922 conference at Washington.

In any discussion of the elements of sea power it is requisite to have a clear idea of the naval terms "strategy" and "tactics." Strategy is that part of the art of warfare that determines, after a well-reasoned consideration of all the elements involved, the time when

and the place where, an offensive campaign shall begin. Decision is based upon a reasoned estimate of the forces involved and their distribution, and the probable course of action by the enemy. Tactics is the art that determines the method of employment of the armed forces available. It was a strategical conception that impelled France to retain the submarine in 1922, and Great Britain to demand the large number of cruisers in 1927.

It is essential for the economic life of Great Britain always to have the trade routes that supply the country with petroleum, food, cotton and similar necessities kept open and immune from attack by an enemy armed with submarines as well as with other craft. This point was accentuated at the Geneva Conference and stress was laid upon the fact that the many cruisers demanded by Great Britain were for defensive purposes. Literally, that is true. As a matter of fact, however, all actions taken by nations in order to win a war are offensive in character. Defending trade routes, for example, is an essential step in getting ready to launch an offensive.

In a general sense everyone is familiar with the submarine. Its war record won it universal recognition and notoriety. Yet certain of its developments, such, for example, as carrying aircraft, shelling armies on the march, participating in the service of supplies, and the like, are less commonly known. With both its record and its possibilities, this chapter will deal.

The modern submarine is neither more nor less than

a diving torpedo boat. Its principal function is to carry the automobile torpedo within striking distance of an enemy. Its value lies in its invisibility, its power to deliver an unseen attack, and the destructiveness of the torpedo. Its weakness is its vulnerability when on the surface and its inability to remain under the surface for long periods of time. Submarines of the present day may be divided into two types. The large cruiser type that can accompany the fleet is usually called a fleet submarine. This type may be employed, as are cruisers, for scouting, operating against the enemy's trade routes, laying mines before enemy ports and harassing an enemy fleet with mines and torpedoes. Undoubtedly vessels of this type will soon be as large as 3000 tons. There is no great technical difficulty in designing submarines that could at the same time carry mines, mount guns of six-inch calibre and even several aircraft. The United States now has a submarine capable of carrying one small plane.

The second type of submarine, known generally as the first-line type, is smaller, averaging about 800 tons. Boats of this type are designed to operate near the coast line of their own countries or from bases, to prevent blockades, minor attacks and for other purposes within the limitations of their size and speed. According to the latest information obtainable, the United States has, built and building, 9 fleet submarines and 50 of the smaller or first-line type; Great Britain 13 of the fleet type and 32 of the first line; Japan 23 of the fleet type and 45 of the first line; France 3 of the

fleet type and 42 of the first line; Italy 4 of the fleet type and 18 of the first line. In addition all nations have numbers of small submarines of obsolescent types.

The ratios of the submarines of each type among the five great maritime nations are presented and compared with capital-ship ratios in the table shown on page 94.

Submarines of both these types vary in gun power and in speed. In the comparison of the submarine power of nations, tonnage is not the only factor. A nation with bases along the trade routes of the world may employ the smaller type of submarine as effectively as the larger. A nation, however, that has no bases must rely upon the larger type with a large radius of action.

Let us consider first the fleet submarine—the advanced type known in the United States as the V-1. It has a tonnage of approximately 2000 and costs about $7,000,000 to build. Its motive power consists of four internal-combustion engines of the Diesel type. Two of these are about 2000-horse power two-cycle engines. The others are 1000-horse power four-cycle engines. When the vessel is submerged, electric motors which derive current from storage batteries take up the task of propelling it, for no internal-combustion engine can operate under such conditions. The hulls of the vessel are made strong enough to withstand the pressure at a maximum depth of about 200 feet. Within that depth it is possible for them to lie on the bottom indefinitely.

At slow speeds the V-1 can remain submerged for only about 48 hours. Then it is necessary to come to the surface and recharge the storage batteries. The length of the V-1 is 300 feet, the beam 27 feet and the draft 15 feet. It boasts a very large cruising radius at 12 knots, or nautical miles an hour, and carries 6 torpedo tubes—4 in the bow and 2 in the stern—as well as one 5-inch gun and two machine guns. On the surface its maximum speed is about 20 knots; submerged it is 10 knots. A vessel of this size and type can accompany the battle fleet on the high seas under all conditions of weather.

The habitability of the type when submerged is such that the crew can remain down four days or more without being seriously affected. Within the boat the air is purified by being passed by blowers through saline containers, which dispose of the poisonous carbon dioxide. In addition, there are bottles of oxygen which may be used when it is found necessary to keep the required amount of oxygen in the air. At great depths the pressure is kept normal. Should there be air leaks the pressure is reduced by compressing the air and discharging it overboard.

There is, however, one effect always experienced during submergence. It is a feeling of drowsiness, a slowing down of mental and physical activity. A most uncomfortable feature is the high temperature within the boats when in tropical waters. Under such conditions the air is kept in circulation by fans, and the mental reaction to this practice gives fairly satisfactory

results. For the further comfort of the personnel, comfortable bunks are provided for the crew and small staterooms for the officers. A cold-storage plant is installed, so fresh provisions may be carried on long cruises. Improvements in the mechanical details have kept pace with the advance in living conditions. The Diesel engines are entirely reliable. Wireless communication has progressed to such an extent that a boat is seldom out of touch with its home base or with the fleet. During the World War orders to and reports from the German U-boats at sea were transmitted constantly, promptly, and accurately.

A submarine of the V-1 type carries a captain with the rank of commander, an executive officer, two engineer officers, and others. Its crew of 90 includes engineers, torpedo men, electricians, and men of other ratings to handle the ship, man the guns, and similar details. Officers and men alike must be trained for submarine work. In the United States service this training is given at a large submarine base at New London, Conn. The course includes theoretical as well as practical instruction. In former years service on submarines was decidedly uncomfortable, but now the crews have all conveniences and escape the discomforts that at one time made it difficult to secure volunteers for that service. Enlisted men who serve in submarines receive $5 a month increased pay and, in addition, $1 for every day or part of a day the vessel is submerged. As a result of all these advantages and

of freedom from military and other drills, duty on the submersibles is often sought.

A vessel of such characteristics as the V-1 is designed to accompany the battle fleet at all times and may have various strategic and tactical employment. Scouting, screening the fleet, mine laying, attacking the enemy main fleet during a major engagement, and following a defeated enemy or protecting the retreat of its own ships in case of defeat—these are some of the duties it may perform. Another use may be cruiser warfare against enemy merchant shipping. The cruiser submarine is capable of exercising the right of visit and search in the manner laid down by international law as applicable to surface vessels. It should be remembered, however, that unrestricted submarine warfare against merchant vessels was outlawed by the Washington Conference of the Limitation of Naval Armaments.

The smaller submarines which are not capable of extended cruising are, nevertheless, extremely valuable in the defense of harbors and coasts. Operating from shore bases they can prevent an enemy from seizing a base on their nation's coast or on an outlying island. Failing that, they can make enemy operations from its own base exceedingly difficult and hazardous. The advent of the submarine has furthermore made the close blockade of harbors and coasts a thing of the past. No fleet can remain within a few hundred miles of an enemy harbor without being subjected to submarine attack day and night. In the field of tactics the sub-

marine has forced the surface ship to steam at high speed and on zigzag courses whenever it is in waters where an attack may be expected. For protection against such submarine activities, capital ships must be screened by a large number of destroyers or cruisers. The best defense against submarines is, however, high speed and zigzagging. When submerged the submarine's speed is slow, and a target proceeding at high speed materially reduces the opportunity for an attack. If, in addition, the target is steering an erratic course, the submarine's chances for successful attack are still further minimized.

For defense against the submarine, depth charges dropped from small and fast surface craft, usually destroyers, over the area in which the presence of the submarine is known or suspected, constitute one of the most effective methods developed. The depth charge consists of a large charge of high explosive, fitted to explode automatically at a predetermined depth. If the explosion takes place near the submarine, the latter will be sunk or put out of action.

At the outbreak of the World War the belligerents were not equipped with large sea-going submarines. Those they had were of about 500 tons and had comparatively short cruising radiuses, poor habitability and unreliable engines. As the war continued, the boats became larger and more habitable, the engines developed in reliability and the cruising radius was increased. German U-boats crossed the Atlantic and

operated off the Delaware and Chesapeake capes without refueling. Although their active operations on our coast were limited to a few days, they showed the possibilities of the U-boat cruisers.

At first both the German and allied submarines were used against strictly military objectives. On both sides boats were dispatched to cruise off enemy ports to gain information of enemy movements and to attack enemy vessels when opportunity presented. The first notable success gained by a submarine was the sinking of the British cruisers *Hogue, Cressy,* and *Aboukir* by the German submarine U-9 in September, 1914. These three cruisers were proceeding at slow speed with no protecting small craft when the first was torpedoed without warning. The remaining two stopped to rescue the survivors and became easy targets for the U-boat. Successful attacks by submarines on combatant vessels, however, grew comparatively rare after the opening phases of the war, when proper defensive tactics were developed.

The German submarine was soon used to sink allied commerce and shipping, and continued that offensive, with one or two short interruptions, until the armistice. The losses to allied shipping were enormous. It is generally conceded that had Germany delayed her unrestricted submarine campaign against merchant shipping until she had an adequate number of efficient boats built and in commission, she could have brought such pressure to bear on the British that the war might have ended after the first two years, and with peace

terms highly favorable to Germany. As carried out, the first German efforts were of experimental nature and were done with an inadequate number of boats. Although the losses inflicted on allied shipping were large, they were not effective, and time was given the Allies to devise countermeasures to combat the menace. Anti-submarine methods took many forms. Harbors were protected by the use of steel nets stretched across their entrances. Patrols of small craft were established to attack the submarine by gunfire and by ramming whenever it could be seen on the surface. These vessels were later equipped with hydrophones and depth charges to enable them to follow the submarine by sound and, on locating it, to drop bombs in the vicinity. The patrol vessels, which included drifters, trawlers, and motor launches, were assigned definite areas, which they covered as regularly as was possible.

Another method was the employment of so-called Q or mystery ships—vessels disguised as merchantmen, rigged up to be unsinkable and carrying concealed guns. Such vessels proceeded to submarine-infested waters and invited attack. If the submarine was not too cautious and came to the surface to accomplish its work of destruction, the Q ship threw off its disguise and opened fire. Several German submarines were sunk by this method, but its effectiveness waned as U-boats became familiar with the practice and ceased to expose themselves.

Table showing submarine and capital-ship ratios

	United States	Great Britain	Japan	France	Italy
Actual ratios, fleet submarines:					
Tonnage	3.75	5.00	7.67	2.21	1.25
Number of vessels.	3.46	5.00	8.84	1.15	1.54
Capital-ship ratio ..	5.00	5.00	3.00	1.67	1.67
Actual ratios, submarines, first line:					
Tonnage	7.63	5.00	6.36	8.30	2.49
Number of vessels.	7.81	5.00	7.03	6.56	2.81
Capital-ship ratio ..	5.00	5.00	3.00	1.67	1.67

Thousands of mines were laid in the North Sea to hinder U-boat activities and in an attempt to keep them at their bases. The northern barrage stretched across the North Sea from Norway to the Scottish Islands. An additional barrage was laid across the Dover Strait, and this, together with nets and patrols, soon made the passage of the strait by submarine difficult and dangerous.

The most effective of all the anti-submarine measures adopted by the Allies was the convoy system. Under this system merchantmen were assembled in groups and sailed under convoy of men-of-war. The convoys were given definite routes to follow, and these routes were changed at irregular intervals. If enemy submarines were reported along the track of a particular convoy, the course of the convoy would be changed by radio. The convoy system was so successful that at the time of the Armistice submarine

sinkings were markedly decreasing and the submarine cruiser was no longer considered a grave menace.

Although destruction of commerce early became the governing mission of the German submarine, some continued to carry out operations more military in nature. In August, 1915, for example, the U-24 bombarded a benzine factory near Harrington, on the west coast of England, and caused it to blow up. The U-38, in 1916, after sinking the English submarine tender *Kangaroo* and the French gunboat *Surprise,* engaged the fortifications at Funchal, Madeira. On the Fourth of July, 1917, a U-boat bombarded the town of Ponta Delgada, Azores. This attack was frustrated by the U. S. Collier, *Orion,* which fired on the U-boat and caused it to retire. In 1917 German submarines on several occasions joined in engagements between the Tripolitans and Italians. Officers, munitions, and weapons were transported back and forth from the forces engaged in North Africa, several boats being converted for that purpose. Two other special missions carried out by U-boats were the cruise of the U-53 to the United States—Newport, R. I.,—and of the U-19, which landed Sir Roger Casement, leader of the Irish Nationalists, on the coast of Ireland in the Tralee Bight. The U-53 was out 42 days and cruised 7750 nautical miles without replenishing fuel or lubricating oil.

On all their cruises the German boats were subject to constant attack by all the various anti-submarine facilities of the Allies from the time they sailed from

their home ports until their return. Their losses were heavy, amounting to 199, which included 6 boats interned and 15 blown up when bases were abandoned.

The experience of the UC-26 illustrates what the U-boat could expect at any time. This vessel was returning from a successful cruise near Le Havre and Cherbourg when it was rammed by an English destroyer at night off Calais. The ships were so close when they sighted each other that the ramming tactics of the destroyer could not be avoided by the submarine. The submarine sank immediately in about 140 feet of water, the entire forward part of the boat being flooded. Depth charges exploding near the sunken boat extinguished the electric lights. After all efforts to raise the boat by blowing tanks had failed, the crew assembled in the central operating compartment, which was still free of water. Then, as a last resort, high-pressure air was admitted to the conning tower to equalize the pressure inside the boat with the pressure of the water outside, and thus permit the opening of the hatch. As expected, the hatch was blown open and several men near it were blown out of the boat. None of these survived. The only men saved—a reserve officer and a machinist's mate—did not leave the boat until the pressure had fallen somewhat and equalized. They were unconscious when they reached the surface, but recovered quickly and were picked up by a destroyer.

Many hazardous experiences fell to the lot of the seamen who served the Allies in submarines. Con-

trary to the general opinion held by the experts before the war, submarines did fight submarines. During hostilities the work of these boats of the Allies was veiled in secrecy, but for numbers engaged it showed as high a percentage of German submarines sunk as did any of the other methods in use.

Regular patrols were kept up by these boats in the Heligoland Bight, the Irish Sea, and off the western entrance to the English Channel. When the United States entered the war one of her first contributions was to send available submarines to augment the Allied sea forces. One division arrived in the Azores in the fall of 1917 and operated in that area until the Armistice. Two more divisions were sent to Ireland the following winter and operated with the British.

Life on board the patrolling allied submarines meant hardship and constant strain. Submarines look much alike, so all surface craft had orders to shoot first and question later when a submersible was encountered. Although the Allies' boats were outfitted with recognition signals, there was seldom time to use them before shells or depth charges began to fall. The submarine was everybody's enemy and its only safety lay in keeping out of sight at all times.

On patrol the usual procedure of the Allies' submarines was to cruise submerged during daylight and come to the surface during the hours of darkness to recharge storage batteries. In North Sea latitudes this meant that during the summer months the boats remained submerged about eighteen hours. Contacts

with enemy submarines were frequent. In some cases gun actions took place between the hostile craft; in others ramming tactics were attempted. As a rule the torpedo was the weapon used. When it hit, the result was never in doubt.

One incident, a daring attack in the Weser River by a British submarine, had an amusing aftermath. The commanding officer decided to investigate the German coast without waiting for orders from superior officers. He proceeded to the eastward, diving to avoid destroyers and patrol vessels, until he arrived at the Weser. Here he sighted a large U-boat on the surface, just in from a successful cruise. His torpedo hit amidships. Immediately after sinking the U-boat the British ship was attacked by destroyers and, to escape, went to the bottom and lay there through the day. Depth bombs were dropped and sweeping was resorted to in the effort to destroy it. At one time a sweep wire was heard to scrape its whole length. The boat weathered all these attacks and returned safely to port. The commander was reprimanded for leaving his patrol billet without order. A year later he was decorated for that same act.

The case of a British submarine which was attacked by three United States destroyers illustrates what the submersible on patrol could expect from friends. Diving in a rough sea, the submarine's conning tower broke surface and was sighted by destroyers, which opened fire with guns and then attacked with depth charges. The submarine dived to 200 feet, when the

first depth charge exploded and jammed the after diving rudders hard up. Four more heavy explosions shook the boat and, as it could no longer be controlled, the tanks were blown and it rose to the surface. When it broke surface the destroyers opened a heavy fire. One shot struck the hull just abaft the conning tower before the submarine could make its identity known. The destroyers were commended for the efficiency of their attack.

British submarines were active also in the Dardanelles and in the Sea of Marmora and did great damage to Turkish shipping. Forcing the straits was an extremely hazardous undertaking and five boats thus engaged were lost. One was sunk by a U-boat off Constantinople, one was caught in the submarine nets at Chanak, two were sunk while entering the Dardanelles, and one was sunk by gun fire in the Marmora. Several times boats dived into the harbor at Constantinople and torpedoed vessels alongside the dock. Water traffic was entirely disrupted during these raids and large numbers of vessels were sunk, including the Turkish battleship *Messidiyeh.* On one occasion two British submarines shelled troops on the march along a road near the shore. Several columns and a transport train were dispersed with great casualties.

Even in times of piping peace the hazards met by submarine crews have often led to disaster. The Japanese submarine 43, of 700 tons, was sunk off Sasebo by a cruiser. The boat was located and salvage undertaken. Telephonic communciation was estab-

lished with the men alive in the submarine. The first message received, at 4.20 P. M., was:

"Having felt that the boat collided, asked the commanding room for an order. Not having received any reply, stopped the motors. Those in engine room retreated to the motor room on hearing colliding sound. About 2 P. M. an explosion was heard and all lights went out and the boat inclined to port about 50°. Sea water is running in. Oil from tank also. Oh, how agonizing it is. Please do something as quick as possible. Again water is rushing in from engine room. Please do something to prevent this. Motor on port side is now under water."

The survivors at this time were eighteen, commanded by Lieutenant Ogawa. At 4.27 word was received: "Breathing is difficult. It is just like when climbing up a hill, running."

The story continues; at 4.45: "There are six air purifiers and they are distributed one to every three men and they are sucking them by turns. It is pitch dark and this is greatly handicapping us."

An hour later: "If floating dock is here will you not tow us to shallow water? Arrangement for emptying of main tank is ready, but as valve of commanding room is not open, please open it at once."

Then Lieutenant Ogawa came to the phone and said, "I make this report to the commanding officer: Men are making their utmost efforts, obeying orders well, calmly attending to their assigned duties. Please report this fact to the authorities. Water is now wash-

SUBMARINES OUT OF COMMISSION PHILADELPHIA NAVY YARD

ing our feet, but we are working hard through the dark. Please do your best to save us. Carbon gas is becoming thick, and breathing is difficult."

At 6.40: "Is there any chance of our being raised during today? Is it day or night? What time can it be? What efforts are you making above? Breathing is ever becoming more difficult and we are slowly letting air out of the reservoirs."

Next came the report: "One man has just dropped; now two more."

At 7.30, suddenly, in a strong voice "Banzai!" was heard three times, and the words, "Hurry, hurry," came faintly through the telephone.

At 8:10, Lieutenant Ogawa, between gasps for breath, managed to say: "As regards my personal matters, I have nothing to say. I have made up my mind; please do not worry. Please do your best for the country—please, please."

At 8.45 someone called, "Hurry, hurry," three times. All was over.

In our own service we have lost four submarines—the F-4, S-5, S-51, and S-4.

The F-4 was lost off Honolulu with all hands. Later this boat was raised. The cause of the loss was never determined. The S-5 went down in shallow water off the Delaware capes. The boat was newly commissioned and was training the crew in diving. On a dive a valve in a ventilating pipe was not closed and the boat was flooded. Water-tight doors were closed and the crew assembled in the after part of the

boat. Fortunately the water was shallow, and by blowing out ballast the stern was brought above water. The men in the boat drilled a hole through the hull. A stick with a shirt tied to it was stuck through the hole. The distress signal was seen by a passing steamer, the *Alanthus*. Later came a second steamer, the *George W. Goethals*. Using a ratchet drill, the two chief engineers of these ships, after many hours of difficult work, drilled a hole in the plating and all hands were saved after an imprisonment of 37 hours.

The S-51 was sunk off Block Island by a steamer. There were only three survivors. The S-51 was proceeding on the surface at night-time with all navigational lights burning. The S-4 was sunk by the Coast Guard destroyer *Paulding*, December, 1927, with the loss of all hands.

Extraordinary as some of these experiences may seem, they were no more thrilling than those which marked the earliest days of the submarine. For submarine warfare has a far longer history than is commonly suspected. According to Herodotus, during the invasion of Greece by Xerxes, a Greek diver cast off the cables from the Persian ships during a storm and caused them to be driven ashore and wrecked. In the sixteenth century, divers were used by the Turks during the siege of Malta. The first authentic submarine war vessel, however, was invented by David Bushnell, a student at Yale, during the Revolutionary War. He conceived the idea of destroying the British men-of-war blockading the American coast by explod-

ing a charge of gunpowder, contained in a water-tight magazine, beneath their bottoms. To accomplish this he built, in 1776, a boat capable of containing an operator and sufficient air to supply him for 30 minutes. Provision was made also for the admission and ejection of water ballast. The oars were constructed on the principle of the screw. The torpedo consisted of two pieces of oak timber hollowed out and containing 150 pounds of powder. This was attached by rope to a screw, intended to be fastened into the planking of the vessel attacked. It was to be fired by a flintlock operated by clockwork. Although efforts to use the boat effectively failed, many of the principles incorporated in its construction can be recognized in more modern designs. The improvements were due to progress in engineering.

Robert Fulton, in 1801, built a submarine in Paris for Napoleon. Although he demonstrated its ability to remain submerged at a depth of 23 feet for one hour, French officials rejected the craft because they felt such form of warfare was immoral. England, too, declined to purchase his craft, and although the United States showed some interest, nothing came of it.

The next step in the story of the submarine occurred during the Civil War when, in an effort to break the Union blockade, the Confederates developed a submersible, known as the David because of its diminutive dimensions. The first David was a cigar-shaped vessel of boiler iron, 54 feet long, with a beam and

a depth of 6 feet. It was equipped with ballast tanks which when filled with water submerged the boat until only some 10 feet of her superstructure remained above water. An ordinary steam boiler provided steam for a marine engine connected directly to the propeller by a shaft. When trimmed down to the awash condition it resembled a large floating plank with a projecting funnel, which could be lowered into the boat. A torpedo consisting of a cylindrical copper case, 10 inches in diameter, 32 inches long, and containing 134 pounds of gunpowder, was carried on the end of a projecting spar and formed the offensive weapon. The torpedo was fitted with a chemical fuse which exploded the charge on coming in contact with the side of an enemy ship.

The David type cost many lives and sank at least five times before it accomplished anything. Finally a David, propelled manually by a crew of eight men, torpedoed and sank the Federal corvette *Housatonic* at Charleston in February, 1864. The attacker went down with its victim and all aboard were lost.

The First Navy Submarine

John Philip Holland, an Irish-American teacher, conceived and brought to success the practical and efficient boat of today. Holland built and tried out his first boat in 1875. It was a one-man craft with a length of only 10 feet, but it was practical. The ade-

quacy of the air supply was demonstrated when its inventor remained totally submerged in his craft for 24 hours. Later he built a larger vessel, called the *Fenian Ram.* It was 30 feet long and 6 feet in diameter, and had a displacement of 17 tons. In spite of many defects this boat was a success in its ability to maneuver on the surface and to submerge, and it aroused wide interest. During this period the Navy Department took no official cognizance of Holland's experiments, although naval officers studied their outcome closely.

Years later the Holland company, after further development, built a boat which, as the *Holland,* was purchased by the Government in 1900 and became the first submarine in regular commission in the United States Navy.

The *Holland* was 53 feet long and 10¼ feet in diameter, tapering from amidships to the bow and the stern. Her displacement was 75 tons. She was driven by a 50-horse power gasoline engine on the surface and by electric storage batteries when submerged. Her armament consisted of one bow tube for firing an 18-inch automobile torpedo. The ballast tanks were designed to hold sufficient water to sink the boat to the awash condition. When awash there still was a slight amount of buoyancy. To submerge, the motors were started ahead and the boat was steered beneath the surface by diving rudders. If the motors were stopped while the boat was submerged, she would automatically rise to the surface due to a reserve of

buoyancy. The method of diving a submarine has not changed. A modern boat is still handled as was the *Holland.*

All the essentials necessary to make the submarine a formidable engine of destructive warfare were contained in the *Holland* except one—the periscope. In order to see a target and to direct the torpedo the submarine was forced to expose itself on the surface. This defect was obviated by the invention of the periscope, a slender tube projecting upward from the hull, which, by a system of lenses and projecting mirrors, enables a man at the eyepiece inside the submarine to see what is taking place on the surface while the boat itself remains submerged and invisible. From the *Holland* the submarine has progressed steadily until such types as the V-1 have been evolved to engage in naval warfare as we know it today.

Much has been said of the effect of the submarine on naval warfare of the future. What of it? Its greatest admirers have envisaged this subsurface craft as relegating the battleship and the cruiser to the limbo of useless and forgotten things. But like many prophecies such statements overshoot their mark. On the advent of any new engine of warfare there have always been strong protestations that the invention would revolutionize warfare; that previous weapons would become obsolete and should be discarded immediately. As a matter of fact, all engines of destruction have different characteristics as to range, accuracy, and destructive power, and new in-

ventions usually have been a modification of the relative importance of the three elements of the weapon. There is, for example, nothing at the present time to equal the 16-inch gun in the combination of range and accuracy and destructive power it represents. The torpedo launched from a destroyer has only one-fourth the range of the gun, and its accuracy is less, but its destructive power is far greater. The destructive power of a torpedo from a submarine is the same as that of the torpedo from a destroyer; the range, however, is greatly decreased and so is the accuracy.

Of course, destroyers and submarines, firing at the extreme range of the torpedo and at a target of a column of battleships 2 or 3 miles long, have a chance for success. However, from a study of naval warfare in the World War, and particularly of the Battle of Jutland, the accuracy of the torpedo truly may be said to be small. The submarine, when submerged, is invisible and thereby may approach the enemy without being sighted. Yet at the same time the enemy is invisible from the submarine, so that the submarine has always great difficulty in obtaining a position wherein it may successfully attack a surface vessel. Particularly is this true if the surface vessel steams at high speed and changes the course frequently and irregularly, both as to angle and time—or, as it is called, "zigzags." One need only study the operations of the Grand Fleet based at Scapa Flow to see that with proper precaution and protection, a fleet may

proceed when and where it wishes in spite of enemy submarines.

The use of the submarine during the World War developed to such an extent that had it been possible to make it a weapon superior to the battleship, unquestionably that would have been demonstrated. The fact that the submarine is not effective against the battleship is due primarly to the tactical limitations which compel it to approach close to its prospective victim and to attain a certain position before firing its torpedo.

Accompanying destroyers will invariably protect the battleship by forcing the submarine to submerge when it attempts to gain this position. It is easy for a destroyer to keep the submarine submerged by means of depth charges, even if it does not succeed in damaging or destroying the submersible.

At the present time battelships are, and probably will remain, the central force from which other elements of naval warfare radiate. A fleet of battleships, accompanied by cruisers and destroyers, may proceed to any destination without serious threat from any dissimilar force. And in this connection, it must be remembered, the history of naval warfare would teach that when naval campaigns are fought between the forces of two powers, one with battleships and the other without, the power with the battleships, under present-day conditions and as far as one can envisage the future, will gain the mastery of the sea.

Advocates of new weapons almost invariably be-

IDLE MERCHANT SHIPS LAID UP AT HOG ISLAND

come so enthusiastic over the possibilities of the particular one they champion that judgment is warped and false conclusions are deduced. Some admirers of the submarine—and among these may be noted distinguished officers of ability and experience—say that the day of the battleship is over. This is precisely the same situation that was discussed 40 years ago, at the time of the perfection of the automobile torpedo and its installation upon small, fast boats. From the elemental principles of strategy and tactics, it may be safely asserted, however, that it will be very many years before the modern battleship is no longer the backbone of the fleet.

The submarine has its functions in war, and these are most important. At times, even, they may be indispensable. But the vessel is neither invincible nor invulnerable. It figures anew in the constant struggle between the offensive and the defensive. With the advent of increased gun power the thickness of armor was increased. Against the threat of the torpedo came measures to destroy vessels carrying the torpedo; and battleships are protected from torpedoes by false sides, or blisters. The threat of the submarine has been met by small fast vessels carrying guns and depth charges. So will it go in the future. In the center of these controversies always there is a rallying point, and that, in naval warfare, is and will continue to be the first battleship.

V

SEA POWER AND THE MERCHANT MARINE

THE sea power of a nation depends on many elements varying in nature and in value. Geographical position, population, wealth, material resources, industrial facilities, naval bases at home and abroad—all these, in addition to strictly naval armaments, contribute to a country's strength upon the seas. Unless, therefore, all of these separate elements are studied and evaluated a consideration of sea power may easily arrive at erroneous conclusions. To make the statement, without such study, that any one nation rules the waves is nothing more than a figure of speech.

As concerns population, wealth, material resources and industrial facilities, certainly the United States may be regarded as second to no other naval power. In the other elements that make for sea power, however, this country is not so fortunately situated. At the present time the British Empire, for example, has more and better situated naval bases, a larger merchant marine and a stronger navy than has the United States. Fortunately, the United States needs but few bases abroad to protect its insular possessions and to assure its commerce freedom on the seas in time of war. Unfortunately, the Limitation of Armaments treaties negotiated at Washington in 1922 absolutely prohibit

our country from having a proper naval base from which to protect Guam and the Philippine Islands. On its own coasts it has two fine ports along the Atlantic and one on the Pacific which may be made into fleet bases. Strategically the Hawaiian Islands are ideally situated for a great fleet base. One is now being constructed near Honolulu, on the island of Oahu. This scarcity of bases clearly indicates the need of the United States for warships of great radius of action. This, in turn, means greatest size for each type of warship. Thus one may see why the United States insisted upon cruisers of the largest size at the convention held in Geneva—a convention that was foreordained to failure, because the naval needs of two of the powers represented differ fundamentally and materially.

In matters affecting national defense, no other nation may be expected to follow the Utopian generosity of the United States as exemplified in 1922, when this country deliberately sacrificed the leadership in naval armaments in the hope that the burdens of competition would be lifted from the naval powers. This hope was gratified so far as certain specified types of naval vessels are concerned. But what may happen as a result? It is quite conceivable that competition may extend to the merchant marine. There are, in fact, indications that this shift in competition has already begun. For this reason the relation between the national merchant marine and sea power, which in turn, means national

prosperity, is worthy of profound study and mature consideration.

Students of modern military, industrial and economic conditions are agreed that the United States needs an efficient merchant marine to assure two important things: the first is adequate national defense; the second, continuation and development of our foreign trade. On these two depend not only the safety but the prosperity of our nation. Let us consider them in order.

In the event of hostilities the value of the merchant ships to the Navy, when used as auxiliaries alone, is approximately 30 per cent. The United States would immediately need their services upon the outbreak of a war. As has frequently been pointed out, certain signatories of the Washington armament treaties, while observing the restrictions against building ships exceeding 10,000 tons, have built so many vessels of lesser tonnage as to far outstrip us in power. To even a greater extent have they outstripped us in the construction and operation of merchant ships.

In his last annual message President Coolidge stated: "More attention should be given to merchant ships as an auxiliary of the Navy. The possibility of including their masters and crews in the Naval Reserve, with some reasonable compensation, should be thoroughly explored as a method of encouraging private operation of shipping."

As auxiliaries, vessels of the merchant type serve the fighting craft of the Navy in many ways. They

have been compared to the railroads, the motor trucks, and the other facilities for freight and passenger transportation which are necessary to the Army in land warfare. They act as tankers to carry the fuel from home ports to warships in distant waters. They serve as refrigerator ships carrying fresh meat and other food to the fighting personnel. They are the cargo ships laden with ammunition, stores and material of war. They are the floating plants in which repairs may be made and fresh water distilled. Some are hospital ships. They may be utilized to spread mines in enemy waters and to sweep them from the channels through which our own vessels may steam. Until more aircraft carriers are constructed they may be made into improvised carriers and mother the planes which form so important an adjunct to the navies of today. They may be tenders for destroyers and submarines. How necessary they may be to the land forces was demonstrated in the World War, when, under naval convoy, they carried soldiers and marines to the number of 2,000,000 safely across the Atlantic and back home.

These duties represent only their service as auxiliaries. Actually the swift modern merchantman may be converted into something closely approaching a warship in comparatively little time and at comparatively small expense. The British realized this and had at least one armed merchantman carrying two 4.7-inch guns on the seas more than a year before the outbreak of the World War. When hostilities were declared,

about thirty-nine British merchant ships had been thus armed. During the naval warfare which followed, the Tenth Cruiser Squadron was an effective unit of the British sea forces. It was composed of twenty-five armed merchant ships, larger and with a longer steaming radius than many of the old cruisers, and therefore better adapted to the work of patrol and blockade. This squadron patrolled most effectively the waters between Scotland and Norway, and prevented supplies reaching the enemy via the neutral nations of the Baltic Sea.

The naval experts and diplomatists who met at the Washington Limitation of Armaments Conference in 1922 recognized the adaptability of properly designed merchantmen to warfare at sea and included in the treaties several provisions permitting the decks of such ships to be strengthened so they might mount 6-inch guns in the event of war. It may be seen readily that any power having a large number of merchantmen will benefit by this provision. The *Karlsruhe,* the *Emden* and the *Dresden*—three effective German commerce raiders—carried 4.1-inch guns, and everyone knows how great was the damage they inflicted upon commerce. Merchant ships armed with 6-inch guns will have in the future no reason to fear any raiders thus armed.

Recently there has been announced a plan to construct and operate an American line of vessels capable of crossing the Atlantic in four days. These ships, it was demonstrated at model tests in Washington, could

follow generally in their design the lines of the modern light cruiser. The light cruiser, however, is limited by treaty to 10,000 tons displacement. The proposed four-day liners will be merchantmen, and there is no treaty restriction as to their size. It is probable that they will have a displacement of about 30,000 tons and a speed of thirty knots. The wartime value of such great and swift ships, built on light-cruiser lines and approximating light cruiser speed, should be obvious to anyone. Certainly such ships may operate as light cruisers or as aircraft carriers.

Adaptable ships, however, are not in themselves sufficient to make of the merchant marine an effective naval auxiliary. An efficient personnel is equally necessary. Several of the great naval powers have long recognized this fact and have developed among the officers and crews of the merchant marine a trained naval reserve. The United States is following somewhat slowly their lead.

Among many nations the backbone of the naval reserve consists of ships and crews which receive some form of subsidy or direct payment, on condition that they train in peacetime for possible service in war. Among others, this reserve is built up of men subject to military or naval training. In the United States there exists a familiar naval reserve composed of men who have retired from active service or who, after voluntary enlistment, receive periodic training. In addition there has been authorized by Congress a merchant marine naval reserve composed of men and ves-

sels regularly engaged in the business of transport by sea. This branch of the reserve can, and undoubtedly will, be made an extraordinarily valuable adjunct to our Navy. It is, of course, valuable now, but there is room for great expansion. In the merchant crews are deck officers, navigators and engineers second to those of no other nation.

Great Britain has long recognized the value of such trained sailors to her naval forces and has established and maintained the highly effective Royal Naval Reserve. This organization may include from 10,000 to 25,000 active and experienced members, and approximately $2,000,000 is expended annually for its support. A member of the Royal Naval Reserve must serve his nation where required in time of war and must participate in frequent training on active ships during peace. His training may include gunnery, torpedoes, signals, navigation and fleet maneuvers in the seaman branch, and technical instruction if he is a member of the engineering branch. The services given the British Navy during the World War by the members of the reserve won the highest commendation not only from the ranking officers of the fleet but also from the British Government.

Within the past few months our own Navy has announced its completed plans for the organization of the American merchant marine into naval reserve units. Since members of this branch of the reserve are competent peacetime sailors, but require instruction in wartime work, detailed plans of training have been evolved.

The training will be conducted on what is known as a ship-unit basis. Certain vessels are selected for potential service as naval auxiliaries, as, for example, tankers, supply ships, transports and the like, and to the officers of those ships is offered a course of instruction preparing them for the duties they must perform as officers of naval auxiliaries. Compensation for the time spent in training has been authorized by Congress, but the necessary funds are not yet available. When the money for this purpose is appropriated the officers of the merchant marine naval reserve will receive annually one month's base pay of their corresponding grade in the regular Navy. Apart from their naval instruction, such officers will, of course, remain in constant training while performing the duties of their profession, as the law under which the reserve is formed limits membership to men who follow the sea regularly.

Such, in brief, are the methods by which the vessels and the personnel of the merchant marine may cooperate with combatant ships of the Navy in time of war. Yet this service is after all only a minor feature of the service the merchant ships can give their nation. By continuing to transport imports and exports, they may make a contribution to ultimate success greater than the winning of battles. And wartime service, even of combatant character, is, in turn, small when compared to the service the merchant ships render year after year to a nation during peace.

I have said that an adequate merchant marine is necessary to insure continuation and development of our foreign trade, and with it our national prosperity. History has demonstrated forcibly how true this is. Carthage, Venice, Spain, Holland, Great Britain—all in turn grew powerful and wealthy while they held maritime supremacy. At this time Great Britain, with the most powerful fleet and the largest merchant marine, is the leading maritime nation. Yet the United States was in 1926 the greatest exporting nation and there is every indication that within the next few years it may be the greatest importing nation as well. In 1926 the value of our foreign trade was more than $9,200,000,000, compared to $9,800,000,000 for Great Britain, and our exports exceeded $4,750,000,000.

This foreign trade determines the prosperity and the livelihood of a far greater proportion of our population than most persons suspect. Agriculture, manufacturing and mining, the industries from which most of our natural wealth is produced, are profoundly affected thereby. According to reports from the Department of Commerce, we send abroad approximately 16 per cent of the total value of our agricultural products, 41 per cent of our copper production, 30 per cent of our locomotive production, 39 per cent of our typewriters, 20 per cent of our agricultural machinery and 8 per cent of our automobiles. In the oil industry 35 per cent of the kerosene, 29 per cent of the lubricating oils and 14 per cent of the gasoline and naphtha pro-

duced here are exported. Approximately 8 per cent of our manufacture and mechanical production of all kinds is shipped abroad.

Our imports come from every nation on the globe and enter in some way into the lives of all our people. The farmer needs nitrates from Chile, potash from Germany, binder twine from Yucatan and jute bagging from India. The manufacturer needs raw materials from Malaysia, China, India, Japan, France, Brazil, the East Indies, Africa and Asia Minor. Ships constantly plow the seas bearing these cargoes to and from our shores. Their freight charges present a staggering total. But because we have an inadequate merchant marine the proportion of these charges paid to American carriers is small. How costly this lack of ships has been to our country has been told in a recent statement by the Hon. Curtis D. Wilbur, Secretary of the Navy.

"Today," Secretary Wilbur explained, "our merchant vessels are carrying about 32 per cent of our foreign commerce; it should be at least 50 per cent. The remaining 68 per cent that is carried in foreign bottoms means that we pay annually about $600,000,000 to other countries for transporting our goods. A greater proportion of this we should ship in our own bottoms, and so retain a large part of this vast sum at home. What is paid to foreign ships for carrying the products of our farms and factories is a stream of gold that leaves the country. That which is paid to our own merchant vessels circulates back into the country to

take its part in general industry. The ships required for such a commerce would be built, repaired and provisioned at American sources and would give employment to many of our citizens. Surely this would add to the general welfare and at the same time provide the vessels and experienced seamen so essential to any country in time of war."

American ships did not always play this minor role in the transportation of the cargoes of their own and other countries. In the period between 1795 and 1810 our merchant marine carried 90 per cent of the world's commerce. Until the Civil War practically all American foreign trade was carried in American ships. As a result of that war, however, conditions were so changed that the trade carried by ships under the American flag declined steadily, until by 1914 it had almost disappeared. Then three great maritime nations went to war and their merchant ships were commandeered for war purposes. The effect on the United States of the withdrawal of these ships was immediate. The prices of commodities dropped; our ports were soon congested with freight awaiting export; and our workmen, manufacturers, farmers—the entire community—lost millions upon millions of dollars.

Then, in 1917, the United States entered the war. As the greatest possible defensive war measure, we built a merchant marine that cost the taxpayers $3,000,000,000. I emphasize the fact that this was for national defense. The end of the war—or soon there-

after—found us with a large merchant marine. A great number of the ships, however, were not suitable for commercial competition. This was due to wooden instead of steel construction; to use of coal instead of oil as a fuel; to slowness and to other factors. However, the Government, through the instrumentality of the Shipping Board and the Emergency Fleet Corporation, made an effort to carry American trade in American bottoms. What was the result? The deficit in 1922 was $32,000,000. It is now, I believe, running at about $16,000,000 annually. The percentage of trade carried in American bottoms is slowly but surely decreasing. Thus, in 1919 it was 60 per cent; in 1923, 50 per cent; in 1925, 40 per cent; and now, as Secretary Wilbur has said, it is about 32 per cent.

The explanation of this recent decline in American shipping lies in the fact that our vessels cannot compete with foreign ships. They are, with possibly a few exceptions, not so large as many foreign-owned boats, and of inferior speed. Shipping is a highly competitive industry. The most profitable freights go naturally to the biggest and the speediest carriers. We are neither building nor operating vessels which meet modern requirements. Largely this is because shipbuilding is more costly here than elsewhere, and because our navigation laws, including the Seaman's Act, make operation more expensive. It has been estimated that the cost of building ships in the United States is from 20 to 30 per cent greater than in foreign countries, due to higher priced labor and materials,

and that when the vessel is completed its operating expenses run from 8 to 10 per cent higher under American registry than that of any other nationality.

American vessels must, for example, carry larger crews than those of any other nation. They must pay higher wages. They must bear the expense incidental to the fact that the American system of measurements assigns greater tonnage than does the system employed by other nations. Since canal and harbor dues, pilot charges and other port expenses are assessed on a tonnage basis, the American ships pay approximately 25 per cent more than do their foreign competitors when they enter harbor. In addition to these handicaps, Congress has fixed a 50 per cent duty which must be paid on all repairs done to American ships in foreign countries. Most long voyages make some repairs necessary to the vessels while they are abroad. But the American shipowner is the only one who must pay this duty to his own Government on work done elsewhere. There are still other reasons for our dwindling merchant marine, but these are, to my mind, the most significant.

Under the best of conditions ocean shipping is not a highly profitable industry, and such disadvantages do much to discourage American capital from attempting to develop a merchant marine under present conditions.

There is, however, one advantage which the law gives to the American merchant marine. This is a monopoly of the coastwise and intercoastal trades. As a result the ocean-going, coastwise trade of the United

States equals in size and in value, in ordinary years, its entire sea-borne foreign commerce. But it is for trans-oceanic shipping that a well-developed merchant marine is most necessary. In peacetime it assures the prosperity of a nation; in war, the security. What, for example, would happen were war to break out again while we were without an adequate merchant marine? Our trade would be at the mercy of foreign shipping and freight would cost all that the traffic would bear. Exports would diminish. Foodstuffs and cotton would go downward in price rapidly and many shops and factories would close. Labor would be idle. It would mean what we call hard times.

As recently as 1926 this was illustrated in a minor way, not by war but by an unusual industrial situation in another country. During the coal strike in England that year a great number of British ships which had been transporting our wheat and cotton turned to carrying coal instead. The American agricultural interests were greatly concerned. They feared a tie-up of their products, for lack of ships to move them abroad. This would have meant tremendous losses. Fortunately the Shipping Board was able to commission a number of laid-up vessels to carry the exports. But for this aid, however, the farmers and cotton growers of America would have lost much of the value of their crops through inability to reach the foreign markets.

To no other element of the population is a merchant marine more essential to prosperity than to the grain

farmer of the West and the cotton farmer of the South. These farmers produce a surplus of crops that must be exported and compete in the markets of the world. With orderly marketing and an ability to deliver surplus crops when and where needed, the prosperity of the farmer is assured. A national merchant marine commensurate with the wealth and power of these United States means that more labor will be employed, not only on ships but in shipbuilding plants, mines and in every industry in the country. The $500,000,000 that now annually go abroad will circulate in this country to the benefit of every citizen. Why, then, should anyone shy at a simple word—subsidy? We cannot have a merchant marine without some form of Federal assistance. Government operation of the present merchant marine is costing $16,000,000 annually. Take the Government out of the shipping business, turn it over to private interests, with such assistance as is required by inexorable fact and conditions, and then, and not until then, shall we have a merchant marine commensurate with the needs of the nation.

The system of quantity production now prevalent in industry gives to the manufacturers of automobiles, locomotives, electrical material, agricultural implements and all other goods an output greater than can be absorbed by domestic markets. The surplus must be exported and raw materials imported. Then again, due to the prosperity of the country, our people demand luxuries from abroad. All this goes to create

a foreign commerce totaling nearly ten billions annually. To continue prosperity there must be a protected national merchant marine. There must be protection from cheaper foreign labor and materials in construction—the principle of the tariff—there must be protection to our merchant seamen and officers—that theirs is a living wage in accordance with American standards—protection to ship operators must be given by rectifying adverse navigation laws. Above all there must, in time of peace, be given the active aid and assistance of the Navy. The Navy and the merchant marine are inseparable and interdependent in peace as well as war.

Interdependence between the Navy and the merchant marine may be instanced now in the cry for more light cruisers. As I have pointed out previously, a light cruiser costs $16,000,000 to build and about $3,000,000 annually to operate. A fast liner capable of being transformed into a light cruiser costs no more and will nearly pay for its own operation in time of peace. What a saving and what economic profit may be had, then, in building ten fast liners—$30,000,000 a year saved in operating liners rather than cruisers; foreign markets reached in a week or ten days; mail between New York and the capitals of Europe in five days; passengers carried across the Atlantic in four days; and there are other conveniences and advantages that will accrue to the citizens of the United States by building such liners.

I do not for a moment advocate the building of liners to the exclusion of light cruisers. I suggest that if the war needs of the country call for forty light cruisers, let ten or fifteen of them be converted from fast liners.

Through the efforts of a few farsighted congressmen and of the naval authorities concerned with our defenses on the seas, the public has become familiar with tables showing how certain foreign nations are surpassing us in the construction of warships to which the Washington Limitation Treaties provisions do not apply. Equally interesting, though less familiar, are the figures which show how far we are lagging behind in the construction of merchant vessels. In a recent report from the United States Naval Institute proceedings, Mr. Alfred H. Haag, an eminent authority on international shipping, presents the following illuminating table of merchant vessels of 2000 gross tons or over completed between 1921 and 1926 by the principal maritime nations for transoceanic service:

Country	No. of Ships	Gross Tons
Great Britain	599	3,500,000
Germany	172	950,000
France	72	450,000
Italy	63	506,000
Japan	52	250,000
United States	14	137,000
Total	972	5,793,000

Thus, for every ship of 2000 tons or over designed for foreign trade which the United States has built, Great Britain has constructed approximately 43, Germany 12, France 5, Italy 4 and Japan 4.

But this does not end the story. With the exception of the United States, all the nations listed are either building or have contracted for many more such ships. Naval statistics show that on March 31, 1927, the record of merchant ships building or contracted for ran as follows:

Country	No. of Ships	Gross Tons
Great Britain	142	980,000
Germany	49	395,000
Italy	28	300,000
Japan	19	100,000
France	8	58,000
United States	4	63,000
Total	250	1,896,000

Here it is seen that Great Britain is building 35 vessels, Germany 12, Italy 7, Japan 5 and France 2 to every one of that class being constructed by the United States.

Summarizing the shipbuilding activities of the principal maritime nations in merchant ships laid down, appropriated for, contracted for, built and building, we find the following:

Country	No. of Ships	Gross Tons
British Empire	741	4,588,847
Germany	221	1,348,533
Italy	91	805,945
France	80	507,239
Japan	71	350,556
United States	18	199,884
Total	1,222	7,801,004

As everyone knows, speed as well as tonnage is a most important factor in the comparative value of vessels, whether used for peacetime or wartime service. For that reason the number of vessels referred to in the tables which attain a speed of twenty knots or more is significant. In this class Great Britain has 12, France 11 and the United States 2; Great Britain attaining an advantage over us of six to one. In the class of ships designed for eighteen knots Great Britain has 38, France 19 and the United States 6. In the class built to make sixteen knots Great Britain has 145 and the United States 37; of fourteen-knot vessels Great Britain has 435 and the United States 101; of twelve-knot ships Great Britain has 1280 and the United States 235. From this it may be seen that if the United States is to occupy the place in world affairs justified by its wealth, its industry and its international trade, it must begin immediately a program of shipbuilding with particular emphasis on modern types

designed to compete for, at least, a fair share of our own foreign sea-borne commerce.

What is being done to that end? As this is written several significant projects are under discussion; for legislators and business interests alike realize that this nation needs a permanent merchant-marine policy. One of the measures introduced by Senator Jones providing for operation by the Shipping Board of all vessels that cannot be sold to advantage and for additions, replacements and improvements to the United States Merchant Marine Fleet which would insure the continuance of Government operation has recently passed the Senate. The bill provides further that no ships shall be sold except by an unanimous vote by the members of the Shipping Board. That would mean the continuance of the Government in operating ships of the merchant marine. This scheme will be vigorously opposed by many in the House of Representatives. Also it is opposed to the policy of the President, and I hope it will not become a law. A proposed measure discussed by Representative William R. Wood suggests retirement of the Government from operation and ownership of merchant ships and a subsidy based on mail contracts.

The Shipping Board, which by its activities may be regarded as having averted the disappearance of American shipping from the overseas trade, is also preparing remedial legislation at this time.

One plan which has been suggested to the Shipping

Board proposes government aid to shipbuilders in the form of a huge revolving fund to be lent to shipbuilders at 2½ per cent interest and to be repaid over a period of sixteen years.*

The Government should get out of the shipping business at the earliest practicable moment. In his annual message the President, in speaking of the merchant marine, states:

> Public operation is not a success. No investigation, of which I have caused several to be made, has failed to report that it could not succeed or to recommend speedy transfer to private ownership. . . . It should be our policy to keep our present vessels in repair and dispose of them as rapidly as possible, rather than undertake any new construction. Their operation is a burden on the national treasury, for which we are not receiving sufficient benefits.

The annual report of the Shipping Board has the following interesting and instructive comments on American shipping:

> The board's primary function, as provided in various acts of Congress, is the establishment and maintenance of an American merchant marine. . . . The board's sec-

*Since this was written the Jones-White Bill has been enacted and is now a law. The Bill provides a fund of $250,000,000 to be loaned to those building ships at 2½ per cent interest. There are other provisions to aid in the rehabilitation of the American merchant marine.

ondary function, intimately bound up with the foregoing, involves the operation and liquidation of the Government's fleet of merchant vessels, acquired as a result of the war. As provided by law, the activity is carried on by the board through the instrumentality of a subsidiary organization known as the Merchant Fleet Corporation, whose president reports to the Shipping Board as to a board of directors, the board in all cases determining fundamental questions of policy.

These two principal functions are necessarily closely related, since it was the unmistakable intent of Congress, as clearly expressed in the Merchant Marine Act, that the government fleet was to be so utilized that ultimately it would become part of the privately owned American merchant marine. The board has kept constantly before it this conception of the important rôle that government-owned merchant vessels must play in the upbuilding of our commercial shipping.

Congress has directed in the Merchant Marine Act of 1920 that "as soon as practicable, consistent with good business methods," the vessels shall be sold; but that meanwhile they shall be used, at the discretion of the board, in the establishment of strategic trade routes, these in turn to be disposed of ultimately to private American interests. As a result of the establishment of trade routes by the board, steamships flying the American flag have again appeared in the principal ports of the world for the first time in seventy-five years, not a single one of them in competition with privately owned American flag vessels.

At this writing—June 30, 1927—the board still possesses upward of 800 ships, 307 in active operation and 516 in the laid-up fleet. It holds these lines and individual

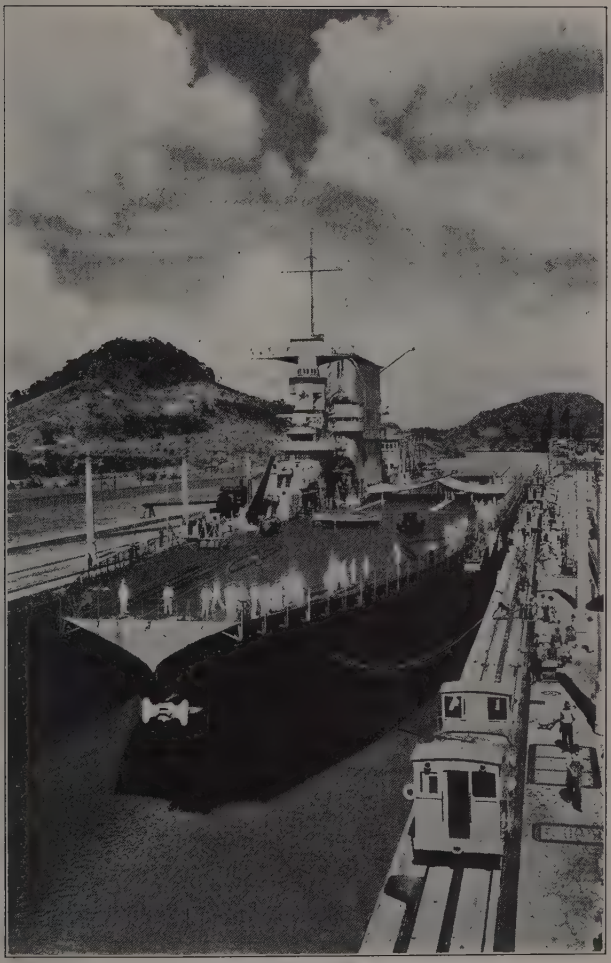
ships out to private capital for purchase under the most favorable terms, and continues to operate upon strategic trade routes only until such time as private capital is disposed to take them over.

A graphic idea of world shipping conditions will be gained from a study of the shipbuilding industry in the principal maritime nations during the past few years. Thus the number of ships of 2,000 gross tons or over, built or now under construction for transoceanic service, from and including the year 1921, shows that for every ship of this class built in the United States, Great Britain has built 43, Germany 12, France 5 and Italy and Japan each approximately 4.

This new construction provides our competitors not only with more ships but also with faster ones, for the modern trend, especially noticeable during the past few years, is all in the direction of speed, coupled with economy of operation due to the use of up-to-date propulsive machinery, largely of the internal combustion type. This is an age in which, other things being equal, the fast ship gets the cream of the freight. We are thus being outclassed not only in tonnage but also in the character of service we are able to render the shipper. More and more are we likely to get the less desirable classes of cargo—the commodities invariably handled by slow ships at low freight rates.

On July 3, 1926, the Senate passed a resolution—Senate Resolution 262—as follows:

Resolved, That the United States Shipping Board be, and it is hereby, requested to prepare and submit to the Senate not later than January 1, 1927, comprehensive and concrete plans for building up and maintaining an adequate merchant marine for commerce and national se-



U.S.S. SARATOGA IN THE PANAMA CANAL

curity (1) through private capital and under private ownership and (2) through construction, operation and ownership by the Government.

In response to this resolution the Shipping Board, on January 11, 1927, submitted a report embodying certain plans for building up and maintaining an adequate merchant marine for commerce and national security. The board's report was made after hearings had been held in thirty-three cities in various sections of the United States. As a result of these hearings, supplemented by responses to 9,000 inquiries addressed by the board to representative organizations and individuals throughout the country, sentiment of the general public was found to be as follows:

1. It was unanimously held that the United States should have an adequate merchant marine for national defense and for commerce.
2. With almost equal unanimity it was held that this merchant marine should be privately owned.
3. With equal unanimity it was held that until it is made possible for private interests to successfully own and operate the American merchant marine the Federal Government must continue to do so.

During the 69th Congress, Senator George Wharton Pepper of Pennsylvania offered a most interesting and helpful bill which had the support of many of the largest shipbuilders in the country. Its purpose was to give a rebate to the shipowners for an amount covering the difference in cost between a ship constructed in an American shipyard and one constructed in a foreign yard—in short, to consider the ship as an

export commodity. Vessels built under the provisions of the bill were to be designed according to plans agreed upon between the owners and the United States Shipping Board, with particular regard to their availability to the Government for conversion in time of war. The Navy should determine the characteristics for this purpose. Nothing as yet has resulted from the original Pepper bill. I doubt if it, or a bill like it, ever becomes a law in view of the passage of the Jones-White bill in the last session of Congress.

These are but a few of the many remedial measures which may come to the attention of Congress. Which of them will meet with its approval it is impossible to forecast. It is clearly evident that any measure framed to help the American merchant marine should have largely in view the following requirements:

1. Operation by private interests.
2. Provisions for extending to shipbuilders and shipowners treatment as generous as that which other governments give their maritime industries, including liberal mail contracts over a large number of years.
3. Elimination of the tariff element in shipbuilding by considering ships solely in foreign trades as an export commodity.
4. Repeal of the law requiring a duty of 50 per cent on repairs made in foreign ports, requisite for voyage to a home port.
5. A system of tonnage measurement which does not impose higher canal, pilotage, harbor and other

dues for American ships than are paid by the ships of other nations.

6. A liberal plan of government aid in financing merchant-ship construction.

7. Provisions whereby vessels built with government aid are designed with the view of their rapid conversion to cruisers and auxiliaries for service in the Navy in time of war. Certainly the designs and prospective employment should meet the approval of the Navy Department. Also there should be an arrangement whereby the officers and crews should form a naval reserve, and for their service therein they should receive a fair compensation.

In closing, it may well be said that Faith, Hope, and Parity—these three—engendered the conferences of 1922 and 1927 at Washington and Geneva. Faith and Hope, it seemed, were justified at Washington. Geneva cared less for Parity. Yet Parity is the greatest of these, in the merchant marine as well as in the Navy. On it depend our national security, development and prosperity. The United States should spare neither time nor money to make its merchant marine at least the equal of that of any other nation.

VI

AIRCRAFT CARRIERS

THE aircraft carrier is the most modern and, in many ways, the most important type of warship known today. It was first used in combat at the Battle of Jutland. It was first recognized as a definite and essential unit of the fleets at the Washington Limitation of Armaments Conference. It is a new weapon forged to meet the demands of modern naval warfare.

All great modern warships are, to some degree, aircraft carriers. Battleships and cruisers include, or are prepared to include, airplanes in their equipment, for use in scouting operations and in spotting accuracy of gunfire. Such vessels may carry from two to four planes each, depending upon size and type. Destroyers and submarines will, in the near future, carry airplanes. The two huge dirigibles recently authorized for the United States Navy will each, in all probability, carry from two to four planes.

The airplane carrier of most recent design houses seventy-two or more scouting, bombing, torpedo and combat planes. It provides for them a mobile, two-acre landing field. It is equipped

with repair and service facilities that many industrial establishments ashore might envy. It is, in every sense, a floating airport, with gun protection.

Naval officers first recognized the possibilities of the aircraft carrier in warfare on May 31, 1916. During the early afternoon of that date the British Grand Fleet and the German High Seas Fleet were approaching each other in the North Sea. Neither knew of the foe's proximity until at 2:20 P. M. light forces, scouting ahead of the main bodies, sighted their opponents and reported "Enemy in sight" to the respective admirals. At 2:47 o'clock, Admiral Beatty, commanding the British Battle Cruiser Fleet, signaled to the converted carrier *Engadine*: "Send up airplanes to scout N.N.E." This, of course, was for the purpose of reporting on the composition and formation of the enemy capital ships. At three o'clock a plane left the *Engadine*. At 3:45 o'clock it returned to report that three cruisers and ten destroyers were in sight and that the enemy's course was south. This was most valuable information, and was put to use when the battle began a short time later. It was also an impressive demonstration of the military capabilities of airplanes sent up from carriers to scout in naval engagements.

Five years later, at Washington, diplomatists, as well as students of naval tactics, recognized the important rôle which aircraft carriers may be ex-

pected to play in warfare of the future, assuming their place along with capital ships, cruisers, destroyers and submarines in the battle fleets. In the treaties there agreed upon, the carrier was defined as "a vessel of war with a displacement in excess of 10,000 tons—10,160 metric tons—standard displacement, designed for the specific and exclusive purpose of carrying aircraft. It must be so constructed that aircraft can be launched therefrom and landed thereon." The treaties further fixed the carriers' maximum tonnage and armament and the total tonnage allowed to each signatory nation.

In the period between the Battle of Jutland and the signing of the Washington treaties much had happened to make the aircraft carrier an important addition to the fighting fleets. Aviation had developed stronger wings and had introduced new conceptions of strategy. In the period since the Limitation of Armaments Conference development has progressed still further. The *Engadine* of Beatty's fleet could send up only one small and vulnerable scout. Aircraft carriers of today are prepared to launch planes not only for scouting and observation but also for air battles and for bombing and torpedo attacks. There is a great difference between these various aerial weapons. The scouting plane, for example, is designed to have the greatest possible radius of action and

carries little in the way of offensive armament. The fighting plane is designed to destroy enemy aircraft. It must be swift, capable of quick maneuvering and armed with machine guns. The heavy bombing plane is slow, but sturdy, designed to carry a maximum weight of high-explosive bombs, and the light bomber, a fast two-seater plane, can deliver diving attacks at very great speed.

Thus armed with the different types of planes, the modern aircraft carrier may be regarded as a scout having a radius of four or five thousand miles at a speed of perhaps twenty knots, and a further scouting radius—by reason of its planes—of 1500 miles at 100 miles an hour. It is a weapon with a range of several hundred miles, firing a projectile which carries 1000 pounds of T.N.T., the most powerful of all explosives. The development of aircraft and, *a priori*, of the carrier, is such that now a fleet without carriers, opposed to a fleet with carriers, will be at a great disadvantage throughout a naval campaign.

The aircraft carrier undoubtedly will wield an important influence upon the future design of the capital ship. No longer will armor be placed only on the sides to protect the vessel from shells. It must be placed also on the weather deck for protection against aerial bombs. Aircraft carriers further probably mean an end to the building of the immense, enormously expensive battle cruisers. This question is of particular interest to the naval

powers, for in 1931 the replacement of the oldest capital ships will be permitted under the provisions of the Washington treaties. In the United States much naval opinion has held that it will be necessary to build battle cruisers at that time in order to equal the naval strength of other great powers which include such vessels in their fighting fleets, and that these battle cruisers will take the place of battleships then to be declared obsolete.

It will be recalled that when battle cruisers were first designed and built it was strongly urged that because of their speed and armament they could break through any screen of light forces protecting the enemy main body from observation by scouts and thus obtain much necessary information; and that battle cruisers would deny such information to the enemy scouts. It may readily be seen now that aircraft are superior to the battle cruiser for the performance of this important duty. From 10,000 feet in the air, the observing plane, safe from gunfire, can count the enemy ships and report by radio the position, disposition and character of the forces. If a ship carrying aircraft is called an "aircraft carrier," then a cruiser may be designated as a "gun carrier." The gun carrier will deliver an attack at approximately 20 miles, while the aircraft carrier of the same tonnage can deliver an attack at a distance of two

U.S.S. SARATOGA IN FULL DRESS

PLANE CATAPULTED FROM U.S.S. RICHMOND

to three hundred miles with larger charges of explosives (in the form of bombs) and with accuracy as great if not greater than the gun carrier; the aircraft carrier remaining at all times far beyond the range of the enemy guns and having only to protect itself from enemy aircraft, which it can do with the use of protecting fighting planes. Under certain conditions the weather might hamper its operations; yet despite such possible limitations, the scouting airplane, sent from a carrier, will in the future, in my opinion, give the best and most quickly obtainable information of the enemy. For these reasons it is entirely probable that no more battle cruisers will be built and that replacements in capital ships will be huge battleships of 35,000 tons, mounting nine or twelve sixteen-inch guns.

In view of this great value of the aircraft carrier in naval warfare of the future, it is interesting to compare the strength of the three leading naval powers in the new ships. Under the terms of the Washington treaties the aircraft-carrier tonnage of the United States, Great Britain and Japan is limited to 135,000, 135,000 and 81,000 tons, respectively. The number, tonnage and ratio of carriers now built or being built by the three great naval powers are shown in the following table:

	United States	Great Britain	Japan
Number	3	7	3
Tonnage	78,700	111,500	63,300
Ratio	3.56	5	2.87

These figures emphasize at a glance the urgent need for more aircraft carriers in the United States Navy. The ratio with the other treaty parties, instead of being 5:5:3, is actually 3.56:5:2.87. The United States is at a further disadvantage from the fact that one of its carriers, the *Langley,* was converted from a 13-knot, 12,000-ton collier, and because of its slow speed, is of little use except for experimental and training purposes. The slowest British aircraft carrier can make more than twenty knots and the slowest Japanese carrier has a speed of twenty-three knots. Actually—excluding the *Langley*—the ratio in modern carriers of the United States, Great Britain and Japan is 3:5:2.87.

The urgent need of the United States for more aircraft carriers was clearly demonstrated by the Navy Department when it submitted to Congress, with the consent of the President, a recommendation for the construction of five carriers. As this is written, the House of Representatives has passed a bill for the increase of the Navy in which there is provision for the construction of only one carrier of about 20,000 tons, at a cost not to exceed $19,000,000. This bill has yet to be acted upon by the Senate, and it is thought that that body

will add to the program so that the United States may in the near future attain the full strength in aircraft carriers permitted by its international agreements.

Progress made in aircraft-carrier development may be visualized by comparing the little *Engadine,* with its one plane, and the latest carriers—the United States ships *Saratoga* and *Lexington*—each carrying seventy-two planes. The *Saratoga,* like her sister ship the *Lexington,* is of 33,000 tons, with thirty-three knots speed, and has a main battery of eight eight-inch guns. With such progress in ten years, what may one not expect in the next quarter century?

The *Saratoga,* now the flagship of the aircraft squadron attached to the battle fleet in the Pacific, is an odd-looking vessel. In order to have the main deck perfectly clear for storage of planes, a runway from which planes could take off and space upon which they could alight, it was necessary to lead the uptakes from the boilers to an enormous funnel constructed at the side of the ship. Here is what is called the island, and it is this island that gives the Saratoga its unique appearance. In it are the four turrets, a navigation bridge, signal masts, fire-control towers and other essential features. A plane alighting on the deck of the ship is flying at from fifty to fifty-five miles an hour. To stop the momentum of the plane at landing, ingenious arresting devices are provided on the deck. In addition, there are brakes on the

landing gear of the plane. Without these devices the plane could not be stopped within the length of the ship. With them it is stopped in 150 feet—approximately four times its own length.

The carriers *Saratoga* and *Lexington* originally were battle cruisers. By the Treaty of Washington the United States was permitted to convert them into carriers. They were completed late in 1927 at a cost of about $40,000,000 each and sent to the fleet. Because of their original plans, it was possible to provide underwater compartments that made the ships unusually safe from torpedo attacks. Side armor also gives them excellent protection against other surface vessels, and the aircraft carried on board are more than adequate for protection against air attacks. Apart from eight eight-inch guns placed in four twin turrets, each carrier is armed with twelve five-inch guns that may be used also in a broadside. The anti-aircraft guns are arranged in groups of three, with the maximum possible unobstructed arcs of fire.

The *Saratoga* is 850 feet long on the water line and 888 feet overall. The beam is 105 feet and the draft 31 feet. It is the largest ship that can go through the Panama Canal, whose locks are 110 feet wide. Recently, when the *Saratoga* and *Lexington* went through those locks, there was so little space to spare that each ship had some paint scraped from the sides.

In view of the restrictions to the size of carriers

fixed by the Washington treaties, it is quite probable that these two ships always will be the largest carriers afloat. The maximum speed attainable—thirty-three knots—is, considering the size of the vessels, truly remarkable. It is achieved with the electric-drive system of propulsion. This system has been developed only recently—within the past fifteen years—and since it is now the propulsive system of the latest capital ships in the United States Navy, it deserves more than passing mention. Boilers furnish steam to turbogenerators. These generate electricity that supplies power direct to propulsion motors connected in pairs directly to the propeller shafts. The *Saratoga* has sixteen oil-fired boilers in four separate compartments. These boilers generate about 200,000 horse power. Four 35,200 kilowatt turbogenerators give 118,000 shaft horse power to the driving motors, two on each of four shafts. The principal advantages of the electric drive are that it permits: (1) flexibility in the regulation of speed; (2) application of power at a point nearer the propellers; (3) space saving; (4) elimination of long lines of steam piping; and (5) operation directly from the bridge of the ship. It is of interest to note that the first electric drive was installed in 1912 on the United States collier *Jupiter*, which later was converted into the carrier *Langley*.

The most interesting features of the *Saratoga*, however, are those which adapt it to the duties

of a great mother ship for aircraft. All its planes cannot be carried on the main deck. Many must be dismantled and stowed on the lower decks. When these are needed they are assembled and sent through great hatches by elevators to the main deck, ready to fly. Planes are towed about the deck by small tractors.

Two squadrons of heavy planes have been assigned to both the *Saratoga* and the *Lexington.* These combine the functions of scouting, heavy bombing and torpedo-carrying. Two squadrons of the most modern fighting planes are also carried by each. In addition, the *Saratoga* has twelve observation planes of the record-breaking Vought-Corsair type, and the *Lexington* six of the same class. The Vought-Corsair holds four world's records: (1) speed for 100 kilometres, load 500 kilos, 147.26 miles per hour; (2) speed for 500 kilometres, load 500 kilos, 136.023 m.p.h.; (3) speed for 1000 kilometres, 130.932 m.p.h; (4) altitude, load 500 kilos, 22,178 ft. Also, to each ship is assigned a small utility airplane unit for miscellaneous uses.

The two carriers have been made as self-contained as possible, and consequently the usual facilities of shore airports and air stations are provided. Shops completely equipped to overhaul aircraft and overhaul and test all types of aircraft engines, are installed on these two ships. Special aerological equipment makes it possible to

predict meteorological conditions, and radio compass facilities for directional control of planes, as well as the customary apparatus for communication with other ships, shore stations and aircraft, are provided.

Airplanes may leave the vessels by taking off in the customary way from the flying deck or by being launched by catapult. The catapult was originally designed by the United States Navy to launch planes from capital ships and cruisers, and has been steadily improved until a high degree of efficiency has been attained. It permits a plane to take off even in severe weather and while the ship is underway. The vessel must necessarily be so maneuvered that the wind is coming from the side toward which the catapult will be fired.

Where both catapult and flying deck are lacking, planes may be enabled to rise into the air at sea by stopping the vessel and lowering them over with a crane. The new carriers are equipped with such cranes, in addition to their catapults and flying decks, and can lower planes from the upper deck to the surface of the water. This, of course, is sometimes impractical, due to rough seas. Often it is impossible for many types of seaplanes to rise from the sea when it is rough, or even when a heavy ground swell is running.

A recent and significant accomplishment of the *Saratoga* was its demonstration of ability to aid a huge dirigible at sea. Late last January the

great airship *Los Angeles* made a landing on the deck of the carrier while the ship was proceeding at a speed of fifteen knots. A hose was led to the dirigible from the *Saratoga* and fuel, water, supplies and passengers were transferred from one ship to the other. The operation consumed only about an hour and was considered entirely successful, although only comparatively crude equipment was available. The importance of the demonstration lay in the fact that it promised a new and tremendously expanded radius of action to dirigibles co-operating with aircraft carriers at sea.

Like the battleships, the new aircraft carriers are large and self-contained communities. The *Saratoga,* as has been pointed out, can produce enough electric current to supply the demands of a city the size of Boston. This power is used not only to drive the vessel but to operate the elevators that lift the airplanes, to hoist ammunition, to steer, to raise and lower anchors, to pump water, to ventilate the ship, to drive machinery in the workshop and to operate the interior communication system, the searchlights, the radio and the kitchen and laundry apparatus. To man and operate the vessel a total complement of about 1815 enlisted men and 219 officers—of whom 115 are commissioned aviators—are required.

The personnel includes craftsmen of many trades. For them there are provided all the com-

THE DIRIGIBLE LOS ANGELES MOORED
TO THE U.S.S. SARATOGA

THE LOS ANGELES TAKING ON FUEL
FROM U.S.S. SARATOGA

forts that may be found ashore. Apart from their electrically equipped galleys and diet kitchens, they have a hospital and dispensary, a dental office, butcher, barber, cobbler and printing shops, a laundry, a post office, a photographic laboratory, a refrigerating plant and evaporating and distilling apparatus. Equipment for servicing and repairing the planes includes an optical repair shop, blacksmith and machine shops, a foundry, a wing covering and a fuselage repair shop, an electrical shop, a copper and wire shop, a woodworking shop and sheet metal, welding, radio, engine overhaul and instrument repair rooms. In addition to the purely aviation features of the vessels, the usual requirements of first-class fighting ships are met in every respect. The organization is quite similar to that of any man-of-war, with the addition of an air department, which has supervision over all air matters on the ship. This department has the same status in the ship as do the engineer, gunnery and other departments.

Immediately after the *Saratoga* and the *Lexington* had been launched, actual aircraft operations were begun. The first landing was made on board the *Lexington* by Lieut. A. M. Pride, U.S.N., while the ship was on her way from the building yard at Quincy, Massachusetts, to the Boston Navy Yard. The first landing was made on board the *Saratoga* by Lieut. Commander M. A. Mitscher, U.S.N., as soon as the vessel had left the Philadelphia Navy Yard.

These two ships have cost the Government a very large sum of money. This money, however, was not spent exclusively for the national defense. The experimentation that resulted in the power plants, not only of the ships but of the planes as well, is for the benefit of all industry. The Navy freely gives the benefit of its successes to all industries to which they are of value.

Annually the Navy spends $1,750,000 in aerial research and experimentation. It is spending annually about $12,500,000 for new airplanes and engines. Such expenditures have in part enabled aircraft engine builders to carry on. What this can mean has been explained as follows in a recent article by the Hon. E. P. Warner, Assistant Secretary of the Navy for Aeronautics:

The best example of this service rendered to commercial aviation by the upkeep of an industry on service orders is afforded by the history of the power plant which carried Lindbergh, Chamberlin, Byrd and Maitland to success, and which drove more than three-quarters of the commercial airplanes entered in the recent national air tour. That engine was first built to suit naval requirements and was first purchased by the Navy, and for several years it was upon naval business that the development work was fostered and the overhead expense carried, while commercial orders were few and far between.

Without the support of the service the process of incubation and of gradual growth into the wonderfully successful product of the present could hardly have taken

place at all; or, if it had been carried on by some means, the cost of the engine to the commercial buyer would have been almost prohibitive. Because there was an assurance of a substantially steady service demand, the price could be kept down and the engine could make its way in a field where economic competition as well as inherent performance had to be considered. So successful has it been in finding a place there that it seems likely, extending forward the tendencies of the last two or three years, that the commercial orders for such power plants will soon bulk larger than those for the government services. When that point is reached it will be the Navy and Army which will in turn reap the benefits of economy from factory production on a scale larger than would be possible if it were only government orders that had to be filled.

Thus the peacetime activities of naval aviation, as conducted by the Navy Bureau of Aeronautics, mark an important phase in the development of industrial aeronautics, since every advance in aviation practice which increases the efficiency of our naval air force is a direct benefit to commercial aviation. Naval aircraft necessities have evolved practices in design, construction and operation which have made for the safety, the economy and the efficiency of all aircraft. All these essentials furnish a note of progress and success in the commercial and industrial field. The general practice followed by the bureau is to designate the result desired and to leave the solution of the problem with individual concerns.

The Navy has an aircraft factory at Philadelphia which has given many valuable contributions to aviation. The Bureau of Aeronautics, at the close of the war, realized the necessity of maintaining the private companies then successfully engaged in building and developing aircraft engines, and so gave them contracts to keep their technical organizations active in the construction of new and improved types and to maintain a nucleus of highly skilled mechanics. This policy of maintaining and encouraging the private companies is largely responsible for the present development of aviation. Without such naval support, a number of the companies probably would have gone out of business.

Ten years ago the Liberty airplane engine was of about 350 horse power, developing one horse power for every three and a half pounds. Now the Packard aviation engine of 1250 horse power —twenty-four-cylinder motor—develops one horse power for every eighteen ounces of weight. The Pratt & Whitney Wasp gives one horse power for about every two pounds and the Wright Whirlwind motor—the engine used by Lindbergh, Chamberlin, Byrd and Maitland—of about 200 horse power, weighs only 500 pounds. Not only are the airplane engines of today marvels of ingenuity and lightness, but also they are exceedingly reliable. Travel by air with skilled and licensed pilots is just about as safe as is travel by

rail. Most of the accidents of which one reads today are caused by the inexperience of student aviators or other amateurs and by planes not properly inspected or unfit for flying. Commercial routes have safe planes in charge of competent pilots. The amazing degree of safety achieved is shown in Department of Commerce reports and other statistics on the reliability and security of passenger air transport.

How will those $40,000,000 ships—the *Saratoga* and the *Lexington*—be employed in the event, most unhappily, of war? To answer this question gives the imagination a fascinating problem. Truly there is no new thing under the sun. Birds have soared in the air since the world was new. Man in the air is a variation, having all the attraction of novelty. In a large slow plane he may seek an enemy hundreds of miles away, and finding him, may report the position of that enemy, the types of the enemy ships, the formation of the enemy fleet, together with its course and speed.

All this is of the highest importance to the commander of a fleet. The commander, receiving such valuable information, can estimate the best disposition to attack the enemy. In short, he can plan intelligently for battle. What an advantage to the airplane-equipped fleet if the enemy is without similar information! That is a strategic employment of airplanes.

Let us surmise that as a result of information

thus gained the two hostile fleets approach each other. Then comes a time when they are eighteen or twenty miles apart. A plane, high in the air, gives the distance and direction of the enemy by radio to the flagship and the admiral orders: "Open fire!" Mark well, the fleets do not see each other! A battleship fires a salvo of sixteen-inch guns. In thirty seconds the plane reports the salvo was 1000 yards short and five degrees to the right of an enemy ship, or whatever may be the necessary correction. The gun sights are corrected accordingly and immediately a second salvo is fired. The battle is on. Then from the aircraft carriers rise the bombing planes, protected by the fast little one-seated fighters. Despite the enemy fighting planes, despite the anti-aircraft guns, onward fly the bombers toward their objective—the enemy capital ships. Some may be shot down by enemy planes, some be struck by enemy shell. But by the grace of daring and of courage, some let loose their high-explosive bombs on the decks of enemy ships. And then they return to the carrier—if they can.

Light bombing planes carrying light bombs and capable of a speed of approximately 150 miles per hour, can in small groups dive at the enemy fleet, each plane dropping two bombs while traveling at a speed in excess of 250 miles per hour, all planes approaching from different directions. Targets moving at this speed are extremely difficult to hit.

While light bombs such as these machines carry cannot sink a capital ship, a direct hit on the deck would undoubtedly silence the anti-aircraft guns and broadside batteries and would make it extremely dangerous for unprotected personnel on the ship's deck.

The spotting of the fall of salvos and the attacks by bombing planes are tactical employment of planes.

Development and progress in aircraft design are leading certainly to larger, faster and more reliable planes—planes that not only may fly but also may sail on the sea. This generation has seen the airplane develop from the little unreliable pusher of the Wrights to the large reliable tractors that carried Lindbergh and Chamberlin across the Atlantic Ocean, the former to France and the latter to Germany. Planes now fly 290 miles an hour and attain an altitude of 39,000 feet. They stay in the air for fifty-eight hours. It is not difficult then to visualize a plane that will, within itself, in the not distant future, have some of the qualities of speed, endurance and altitude now possessed by three individual types. That is to say, a plane that will fly 4000 miles at a speed of 200 miles an hour at an altitude of 30,000 feet above the surface of the earth!

The aircraft carrier, which extends the capabilities of these new weapons of naval warfare, has been in the course of development for a longer period than most persons realize. Fourteen years

ago the United States Navy conducted experiments with such an object in view, when it constructed a runway on the quarter deck of the old cruiser *Pennsylvania.* In Europe also many trials were made with devices designed to launch planes from the decks of battleships.

In 1914 the British Navy adapted a tramp steamer, later known as the *Ark Royal,* to aircraft-carrying purposes by fitting it with a flying deck in the bow and two cranes for lifting seaplanes aboard from the water after flight. During the war the ship served in the Eastern Mediterranean as an aircraft depot. It was followed by several more carriers, converted from channel steamers and passenger vessels.

One of the most notable of these was the *Campania,* fitted up in 1915 with a large flying deck equipped with wheel trolleys for the launching of seaplanes. An Italian cargo and passenger ship was fitted with a flying deck fore and aft and with storage place for planes below, and was named the *Argus.* Elevators were built to lift planes from the hangar to the flying deck and cranes lifted the seaplanes from the water. The planes on deck were protected with wind-breaking devices which could be raised to a height of fourteen feet.

Early in 1916 the British naval authorities determined to convert the *Furious,* which had been originally designed as a large light cruiser with

AIRPLANES IN FORMATION

DOUGLAS TORPEDO-PLANE FORMATION

two eighteen-inch guns in single turrets, fore and aft, into an aircraft carrier. The forward turret was removed to make room for a flying deck and hangar. Later the stern turret, too, was replaced with a flying deck. Planes launched from this vessel bombed with great success a number of German airship hangars along the coast. Further alterations to increase the efficiency of the *Furious* as an airplane carrier were completed in 1925. Several other ships originally designed as cruisers were similarly converted as a result of experiments with this vessel. The *Hermes* was the first British ship to be designed from the start as an aircraft carrier. It carries about twenty planes, and, like our own more modern ships, has funnels and other uptakes in an island on the side.

The first aircraft carrier built for the United States Navy was the *Langley,* named in honor of Prof. Samuel Pierpont Langley, famous aeronautical pioneer. Originally the collier *Jupiter,* it was converted in 1921 at the Norfolk Navy Yard. After the coal-handling gear had been removed a flying deck extending from bow to stern was built about 56 feet above the water line. The deck is about 65 feet wide amidships and about 525 feet in length. Like the later carriers, the *Langley* is equipped with arresting devices on the flying deck, catapults, cranes and elevators for lifting planes from storage places below. Service and repair facilities include a machine shop, a wing-repairing

shop, a metal shop and storerooms. In the hold is storage space for accessories, ammunition and fuel and oil for airplanes. When first put into service the *Langley* was prepared to carry twelve single-seater pursuit planes, four torpedo planes and six seaplanes. Naval development, however, is never still and such plans are easily changed.

The Navy is necessary to protect the vital interests of our nation. Particularly it is the guardian of the country's foreign commerce. Without foreign commerce there can be no prosperity. Life without prosperity to an American is scarcely worth living. One-sixth of all agricultural products and the output of many other industries are dependent upon the world's markets. Raw materials not produced in this country must be imported, else certain industries vanish. A merchant marine and a protective Navy are essential to the prosperous economic life of the nation and to the welfare and happiness of every man, woman and child in the country.

Aircraft carriers are an increasingly important part of an adequately protective Navy. We have only three!

VII

THE NEXT STEP

"The thing that hath been, it is that which shall be; and that which is done is that which shall be done: and there is no new thing under the sun."

THERE have been volumes written on the cause and prevention of war. It were futile for me to attempt even to draw an outline of so vast a field. However, it may not be amiss to state briefly the psychical effects I have received from my study and observation over a period of many years.

To me it appears that all causes of war may be defined, in the final analysis by two words: (1) Intolerance and (2) Competition. These two words indicate that the cause of war may be either spiritual or material.

Intolerance of rivalry; of freedom; of religion; of resentment against a growing and prosperous neighbor—these have caused wars in the past. Due to education, to rapid communication and transportation and to the more tolerant spirit thereby engendered, it is quite probable that war springing from intolerance will soon be a thing of the past. This optimism, I believe, is justified by the history of international affairs during the past decade.

More and more does one sense a Will for Peace by the peoples of the civilized nations. And in the nations where the people rule, war based on intolerance has become practically extinct. However, just here one must remember that today many nations are ruled by dictators. Hungary, Poland, Italy and Spain certainly are governed by autocratic power vested in one individual. Though a dictator upon his own volition may not declare war in any country, yet he may so act as to commit his country to a policy that inferentially will result in war. A country once in a war, it follows, as night the day, that the people of the country will fight to the bitter end. Such is the power of patriotism.

Competition, or the material cause of war, has always existed. It abides in the present and probably will endure in the future.

Competition for foreign markets, for raw materials, for natural resources, for expansion due to overpopulation, for the world's carrying trade, for colonial empires and competition in other lesser things—all these abide with us today and surely are to engender friction and differences among the nations. Unless differences among nations are settled diplomatically or by arbitration or in some World Court of Justice, then the settlement is made by the arbitrament of arms. To prevent this last is that which is occupying the minds of all thoughtful and Christian-minded men now in the time of peace.

There is, I think, one kind of competition that

is more provocative of grave international differences than any other—the irrational and insensate competition in armaments; a competition that is based on fear.

It was a statesmanlike conception that made the late President Harding call a conference in 1922, at Washington, in an attempt to limit armaments. The results of that conference is very well known. There were treaties signed limiting the naval power of the several nations. One is familiar with the terms of these treaties, so there is no need now to discuss them.

Over a year ago, President Coolidge invited the great naval powers to a conference at Geneva on the further limitations of naval armaments. Only Great Britain and Japan accepted. However, as these are the greatest naval powers, there was a tripartite convention held in Geneva that lasted from June 20 to August 4, 1927. This conference was a failure. For that reason I shall go into it rather in detail and indicate my opinion as to the causes of the failure. I do this for even a stronger reason, believing as I do, that further limitations of armaments is one of the most practical "next steps" that may be taken in seeking a formula whereby war may be avoided—not that limitation, *per se,* may end war, for were limitation carried to an extreme, nations could still wage war on the sea with their merchant marines, on land with ploughshares beaten into weapons, in the air with

commercial aircraft, the products of industrial chemical factories, in fact, with all the available resources of their respective nations.

My belief in limitation as a deterrent of war is this: that there can be no sudden *fatal* attack upon one nation by another when armaments are limited. That thereby there will be no initial grave wounds made in a nation's pride, that would obviate or hinder negotiation. It would give time, before an irrevocable conflict was started, for the exercise of sober judgment and reason.

In the memorandum accompanying the President's message to Congress on February 10, 1927, was the following significant statement:

"The conviction that the competitive augmentation of national armaments has been one of the principal causes of international suspicion and ill-will, leading to war, is firmly held by the American Government and people." It is well to keep in mind this pronouncement.

The object of the Conference clearly then was to limit naval armaments further than was done by the Washington treaties. Since the latter placed a limit on the number of battleships and aircraft carriers, the Geneva Conference could have continued limitation so as to apply to cruisers, destroyers and submarines.

In accepting the invitation to the Conference

both the Japanese and British Governments made statements presaging difficulty in reaching an agreement.

In the Japanese acceptance, we read:

"4. The Japanese Government are further gratified to learn that it is not the intention of the American Government at this time to put forward rigid proposals on the ratios of naval strength to be maintained by the several Powers in the classes of vessels not covered by the Washington Treaty. In order to ensure the success of the proposed negotiations, it seems highly important that, in the matter of these conditions of the limitation of armament, all parties to the negotiaitons should approach the subject with an open mind, being always guided by the spirit of mutual accommodation and helpfulness, consistently with the defensive requirements of each nation. The Japanese Government confidently hopes that an adjustment will be reached in a manner fair and satisfactory to each of the participating Powers and conducive to the general peace and security of the world."

In the British reply was the statement:

"The view of His Majesty's Government upon the special geographical position of the British Empire, the length of inter-Imperial communications and the necessity for the protection of its

food supplies are well known and, together with the special conditions and requirements of the other countries invited to participate in the conversation, must be taken into account."

To understand fully the proceedings of the Conference, it must be kept in mind that all three delegations largely were composed of naval officers. Naval opinion dominated the Conference.

In opening the Conference the Chairman of the Conference, Hon. Hugh Gibson, an American delegate, read a message from the President in which was stated:

"Please assure the representatives of the British Empire and of Japan that I am only interpreting the overwhelming sentiment of the American people in stating that the United States will do its utmost to make such an agreement possible."

He further outlined the policy of America as concerns naval armaments. Following are extracts from that statement:

"Further, we can start with assured agreement on the following points:

"1. That, in the interest of international understanding, there should be no competition between the three Powers in the building of naval armaments.

"2. That our respective navies should be maintained at the lowest level compatible *with national security* and should never be of a size or character to warrant the suspicion of aggressive intent.

"3. That a wise economy in Government dictates that future naval construction should be kept to a minimum.

"4. That the methods and principles of limitation set forth in the Washington Treaty are both practical and effective and should be extended to all categories of combatant vessels of the Three Powers.

"Our policy with respect to naval armaments is guided solely by the desire for adequate defense. We have no intention of maintaining a naval force which could be regarded as a threat to any Power. Neither have we any desire to initiate a competitive building program in any class of vessel which might influence others to lay down more vessels than they would otherwise consider necessary.

"Pursuant to this policy, the United States is prepared to accept a general program providing for as low a total tonnage in each class of auxiliary vessels, on the basis of the Washington Treaty ratio, as will be acceptable to the other Powers here represented. The American delegation has come to the Conference with an estimate of what we consider equitable tonnage allocation in the various categories of vessels, but with no rigid quantitative proposals. We are prepared to discuss the question of tonnages fully and frankly in the light of our several legitimate needs. It is our desire to have a real limitation which would

obviate the necessity for extensive building programs in the future, and we feel that we should therefore keep in mind that the fixing of unduly high tonnages in the various classes of auxiliary vessels would not be calculated to achieve that result."

The American suggestions are based on the following considerations:

"1. That the ratios and principles of the Washington Treaty be applied to cruisers, destroyers and submarines.

"2. That any agreement concluded here by the Three Powers to limit the building of auxiliary vessels should be made co-terminous with the Washington Treaty and contain the same general provisions for extension or modification. It may be desirable to include an additional provision respecting revision in the event of an extensive building program by a power not a party to any agreement we may conclude.

"3. That, for the purpose of the future limitation of naval armaments, auxiliary vessels be divided into four categories, three of which—namely cruisers, destroyers and submarines—shall be subject to limitation with a fourth category of negligible combatant value not subject to limitation as follows:

(a) Cruiser class, including surface naval combatant vessels between 3,000 tons and

10,000 tons.

(b) Destroyer class, including all surface naval combatant vessels between 600 and 3,000 tons, with a speed greater than 17 knots.

(c) Submarine class, including all vessels designed to operate below the surface of the sea.

(d) An unrestricted class, including other naval vessels of negligible combatant value, the definition of vessels falling in this class to be subject to technical agreement.

"Before suggesting tonnage allocations in the various classes, I desire to state that we frankly recognize that naval requirements are relative, that building programs on the part of one Power may well require corresponding programs on the part of others, and that, if these limits were adjusted for one of the Three Powers, they should be so adjusted for all. The tonnage allocations suggested by the American delegation as a basis of discussion are the following:

Cruiser Class	*Total Tonnage Limitation*
For the United States	250,000 to 300,000 tons
For the British Empire...	250,000 to 300,000 tons

For Japan	150,000 to 180,000 tons
Destroyer Class	
For the United States	200,000 to 250,000 tons
For the British Empire...	200,000 to 250,000 tons
For Japan	120,000 to 150,000 tons
Submarine Class	
For the United States	60,000 to 90,000 tons
For the British Empire...	60,000 to 90,000 tons
For Japan	36,000 to 54,000 tons

"If any of the Powers represented here feel justified in proposing still lower tonnage levels for auxiliary craft, the American Government would welcome such proposals."

The British statement by Rt. Hon. W. C. Bridgeman, First Lord of the Admiralty, contains among other things the following:

"The great achievements of the Washington Conference of 1921 are not perhaps so generally realized as they deserve to be. Let me recall the situation as it existed before that Conference, little more than six years ago.

"Already then, designs were in contemplation for huge battleships of 45,000 tons displacement armed with 18 or 20-inch guns, while the number of such vessels was only limited by the willingness and capacity of any nation to pay for their construction and maintenance. Each nation was watching another, and the danger of a recom-

ADMIRALS AT MANEUVERS, SAN DIEGO, 1924

CONFERENCE AT BALBOA, CANAL ZONE, AFTER SPRING MANEUVERS, 1926

mencement of ruinous competition was imminent.

"The Conference held at Washington put an end to this tendency—a great attainment in itself. But it did more. It proved the possibility of limiting by agreement the scale of armaments to be maintained.

"And so I will begin by an attempt to make clear what are the considerations which govern the position of Great Britain and the British Empire.

"In doing so I shall not be revealing any secrets hitherto unknown. Indeed, I am more likely to be accused of repeating well-worn platitudes.

"Nevertheless, I will, for the sake of clearing the ground for discussion, put the following facts before you, fully realizing that for other countries other considerations deserve the special attention of the Conference.

"First and foremost, there is the insular position of the mother-country, which I represent, and the fact that she is almost entirely dependent not only for raw material but also for her food supplies and her very existence upon free passage upon the seas. It is no exaggeration to say that, if the seas were closed to ships trading with our country, we should be faced with starvation within a few weeks.

"My countrymen would never consent to take any risk of such a catastrophe. This obvious fact places us in a position totally different from that

of any other country in the world, and makes discussion on naval disarmament, I think, more difficult for us than for any other Power.

"The other important factors in our case are the immense lengths of the routes over which our trade is carried and the very large coastlines which bound the various parts of the Empire, and the necessity of providing reasonable protection for these extensive shores and long lines of communication against any aggression, however unlikely such a menace may appear at the moment to be.

"In this second consideration, more closely than the first, the welfare of the outlying parts of the Empire is very deeply concerned. Our situation is very plain, but its very simplicity is a measure of its vital seriousness to us. At the same time, we feel that there are limitations in naval armament beyond those which have been accepted in the Washington Conference to which we could safely agree if the other Powers found themselves able to consent.

"I have listened with very great interest to the statement made by the Chairman, and with a very large measure of agreement with the principles which underlay it, but I think he will agree with me, and I hope that Viscount Saito, too, will agree with me, that today it will perhaps be better to confine ourselves to our own aspect of the question and not to discuss the proposals which

other countries have made. I think we shall be able to discuss them more fairly and more satisfactorily after we have had a little more time to think them over, and, therefore, rather than discussing the proposals which he has made, I should like to lay before you the proposals which I am authorized to make on behalf of the British Government. I shall do it as briefly as I can and without entering into details, which can be left for examination and explanation later.

"The main proposals which we have to make are:

(1) The extension of the accepted life of the existing capital ships from 20 to 26 years, and a consequent waiver by the Three Powers of their full rights under the replacement tables agreed upon at Washington. Such an arrangement would naturally have to provide for some little elasticity on each side of that figure.

(2) The fixing of the life of other vessels—first, that of 8-inch gun cruisers at 24 years; secondly, destroyers at 20 years; and, thirdly, submarines at 15 years.

(3) The reduction in the size of any battleships to be built in the future from the present limit of 35,000 tons displacement to something under 30,000 tons.

(4) Reduction in the size of guns in battleships from the present limit of 16 inches to 13.5 inches.

(5) Limitation of the displacement of aircraft carriers to 25,000 tons instead of the present limit of 27,000 tons.

(6) Reduction of guns on aircraft carriers from 8 inches to 6 inches.

(7) Acceptance of the existing ratio 5:5:3 for cruisers of 10,000 tons displacement carrying 8-inch guns. The numbers of these large cruisers which each of the three countries require can be the subject of further discussion.

(8) Limitation of 7,500 tons and 6-inch guns to be placed on all future cruisers after the number of 10,000-ton cruisers has been decided upon.

(9) Limitation of displacement of destroyer leaders to 1,750 tons and destroyers to 1,400 tons.

(10) Guns in destroyers to be limited to 5 inches.

(11) With regard to submarines, we have not changed our mind since the Washington Conference, when our delegates expressed their willingness to agree to the discontinuation of the use of submarines in warfare, but we recognize that Powers which

possess fewer of the larger vessels of war regard the possession of submarines as a valuable weapon of defense. At the same time, we feel that, if the proposals we have put forward for the limitation of battleships and other more powerful vessels of war should be accepted, it would not be unreasonable to suggest some limitation in the size, and perhaps also in the number of submarines.

We, therefore, propose that the tonnage of the larger type of submarine be limited to 1,600 and of the small type to 600 tons, and the armament of each to 5-inch guns. We also think it would be desirable to discuss the possibility of limiting the number of submarines according to our varying requirements; and it must be borne in mind that any limit placed on the number of submarines would make it easier to limit the number of destroyers, and if agreement were reached on these points with other Powers it might be possible also to consider the numbers of cruisers each of us should possess."

On the part of Japan, Viscount Saito made statements from which the following are extracts:

"The most important object of an agreement

looking to the limitation of armaments lies in preventing the expansion of armaments without at the same time endangering the national security of any Power party to that agreement. Such radical departures from existing conditions, therefore, as may be calculated to shake the foundation on which the sense of security of a nation rests should be carefully avoided."

The Japanese delegation submitted a practical plan of limitation which may be omitted.

It will be noted from the foregoing proposals, that the United States and Japan wanted a real limitation of auxiliary naval craft. That is to say, as regards numbers or tonnage. On the other hand, the British proposals were all in the direction of limiting the size of ships and reducing the calibre of the guns. It is important to note this. For the effort of the British, although admitting parity, was to have a treaty such as to reduce the offensive power of the other Navies.

The British view appeared to be that the discussion was on *disarmament*. As a matter of fact, it was only to *limit* armaments.

The British proposed eleven changes in present conditions, resulting from the Washington Conference.

Consider these seriatim: the first proposal was to extend the life of existing capital ships from 20 to 26 years. Having now a superiority, the

British were willing to ensure this for six years longer. The second proposal was fair and would result in a saving to the naval powers. Proposals 3, 4, 5 and 6, all provided for reducing size or armament of vessels.

Proposal 8 is probably the one that caused most discussion at the Conference.

This requires comment in some detail.

One result of the Washington Conference was to limit cruisers to 10,000 tons and to carry guns not larger than 8-inch calibre. Then the British —always having an eye on control of the seas— began building these large cruisers. Not so the United States. America hoped for further limitation and in accordance with the *spirit* of the Washington Conference. So the Geneva Conference was called and was a failure from the fact that though ostensibly agreeable to parity, the British wished to limit to a small number the *Washington* cruisers, with a limitation as to size and guns of all other cruisers.

At Geneva the British attempted to restrict the large radius of action, heavily armed cruiser and force the United States to build types it did not need.

After weeks of discussion came an impasse. Finally the British delegation went to London for further instructions and returned with a final proposal, made on July 28, 1927, as follows:

"1. The combined total tonnage of cruisers, destroyers and submarines below the age-limit for replacement is not to exceed:

(a) For British Empire and U.S.A. 590,000
(b) For Japan 385,000."

2, 3 and 4 are unimportant.

"5. All other cruisers to be divided into two

(a) 10,000-ton cruisers
(b) Smaller cruisers of a maximum displacement of 6,000 tons and mounting a gun not exceeding 6 inches in calibre."

"6. 10,000-ton cruisers to be limited in number:

For British Empire and U.S.A. 12
For Japan 8."

Note the small number of *Washington* cruisers.

Proposals 7, 8, 9, 10 and 11 are not of serious import.

From a consideration of these proposals it is seen that the British were aiming at two targets.

(1) To keep *Washington* cruisers limited to twelve, and

(2) To raise the ratio of auxiliary vessels be-

tween the British Empire and the United States on the one hand and Japan on the other to 5:3.26, instead of the ratio of Washington Conference of 5:3. Why? To obtain the agreement of Japan?

What would have been the result had the American delegation agreed to this proposal?

The United States has now about 90,000 tons of submarines; 270,000 tons of destroyers; 66,000 tons of *Richmond* type cruisers. Add to this, 80,000 tons of *Washington* cruisers and the total is 506,000 tons; leaving only about 84,000 tons available to build cruisers, destroyer leaders or what not. And the British would still dominate the seas. On the other hand, if the *Washington* cruisers were not limited, the United States could build as many as the security of the nation demands. The crux of the situation is that the *Washington* cruiser can break any British blockade. *Washington* cruisers are of more value to the United States than any other type of cruiser.

From the foregoing, I summarize that the failure of the Conference was due most probably to the following:

1. The Conference was dominated by naval thought and tradition. Psychologically, the military mind is not one of compromise—as it should be for things military.

2. The British proposals were *not* for a real limitation, unless such limitation continued their present superiority on the seas.

3. The attempt of the British to force the United States to agree to build such ships and so to arm them as to make them of little value to the United States. Small cruisers are of importance to Britain by reason of British bases over the world.

4. The attempt by the British to prevent the United States from building the types of ships needed for the security of the nation.

5. And last, but most important, the absence at the Conference of the manifestation of a genuine spirit or desire for a limitation of armaments—a spirit that was to have been expected after the results of the Washington Conference.

Though a disappointment, the tripartite conference at Geneva was not without value. The causes for that failure may be overcome in the future and such radical limitations made as to be a "next step" in reducing the possibility of war.

We naval officers know that there may come "a time to kill," "a time of war and a time of peace." For that reason we urge such a navy, as compared to other naval powers, that will mean security to the nation. Disarmament cannot take place until mankind fears God and keeps His commandments. That is the millennium.

For the present every gesture seeking a solution for this, the world's greatest problem, serves a useful purpose in directing thoughtful minds

to the necessity of a continuous search for a formula that may banish from the face of the earth the greatest of all pestilences—War!

THE END

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